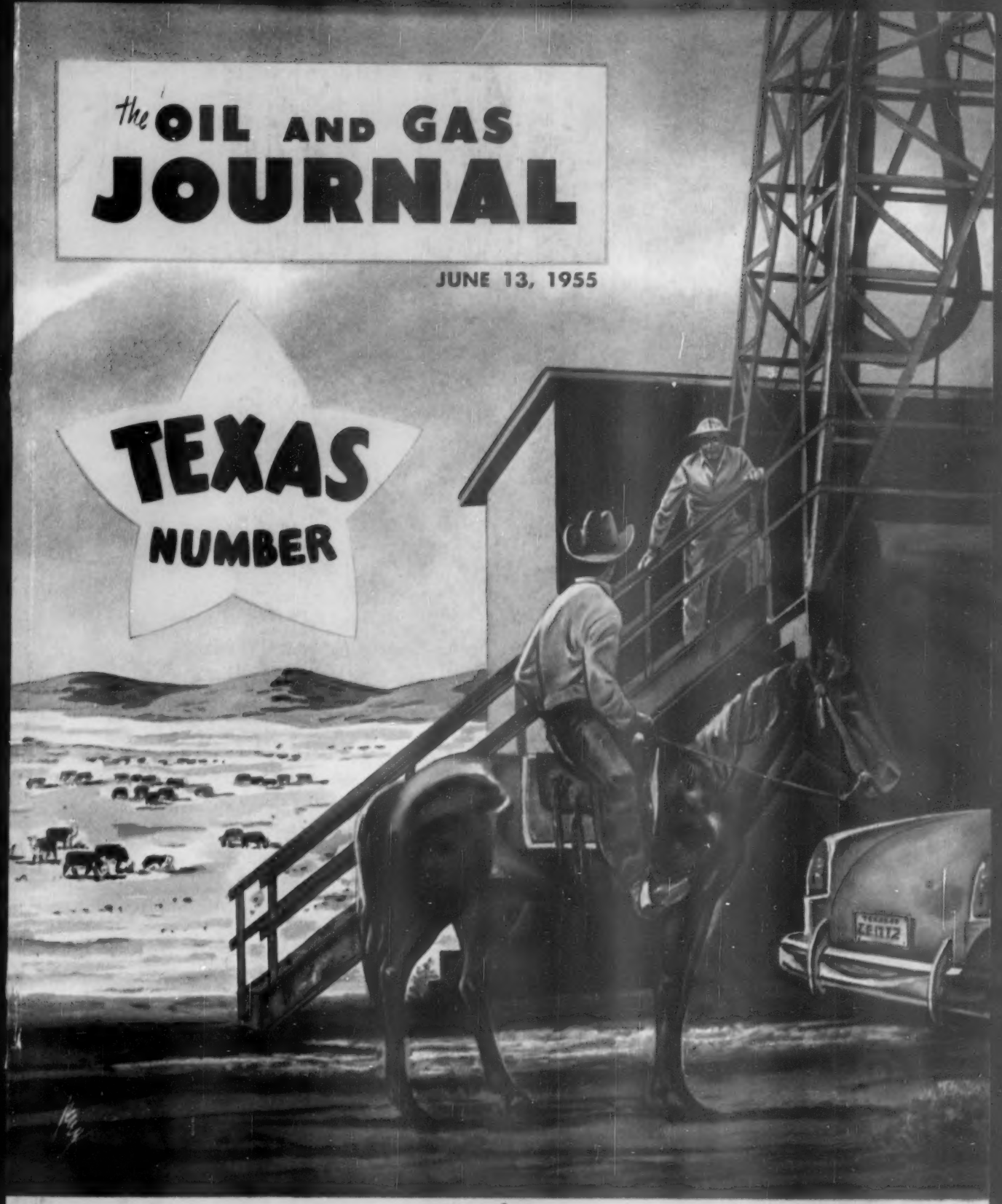
the OIL AND GAS JOURNAL

JUNE 13, 1955

TEXAS NUMBER



Spraberry's Outlook . . .
New recovery method or early death • Page 126

Unionism or Professionalism?
Texas engineers are on the spot • Page 130

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EXPORT SALES — MID-CONTINENT SUPPLY COMPANY 45 Rockefeller Plaza, New York 20, New York Cable — MIDUNITRIG

PAGE 1 ONE . . . *a glance ahead*

Interest in drilling in shallower areas, evident in past couple of years, is getting stronger with both small independents and big operators, and many old areas are being intensively reworked. Quick payout is aided by fast drilling, readily available geological information, formation fracturing, and relatively high allowables on small wells.

Second round of catalytic reformer construction is on the way as refining industry nears saturation of capacity to upgrade prime heavy naphtha feed stocks. Result will be more thermal and coker gasolines charged to cat reformers, following pretreating with hydrogen.

Western Canada expects to nearly double its crude production within 5 years. Output then will equal total Dominion demand but eastern provinces will still be served by imports, so pressure will build up to export more to U. S. West Coast and Great Lakes areas.

Natural-gas "stabilization" is beginning to interest transmission and distribution companies. By this they mean making gas uniform in characteristics by mixing at city gate where supplies are received from different pipelines. Problem will grow with anticipated increase in number of gas interchanges.

Disaster planning will be pressed on oil companies by military and defense agencies. Industry will be asked to give more serious thought to such factors as plant location with relation to residential areas and other factories, sabotage protection, evacuation of employes, and damage-control preparation.

Improvement in seismic recordings and especially their interpretation and correlation with subsurface geology to permit location of stratigraphic traps is chief hope for overcoming decline in demand for geophysical services, in opinion of many geophysicists.

EXPORT SALES — MID-CONTINENT SUPPLY COMPANY 45 Rockefeller Plaza, New York 20, New York Cable — MIDUNITRIG

the OIL AND GAS JOURNAL

JUNE 13, 1955 • VOLUME 54 • NUMBER 6

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Texas Is Undisputed Drilling Champion 159
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Texas Producers in Lead for 27 Years 165
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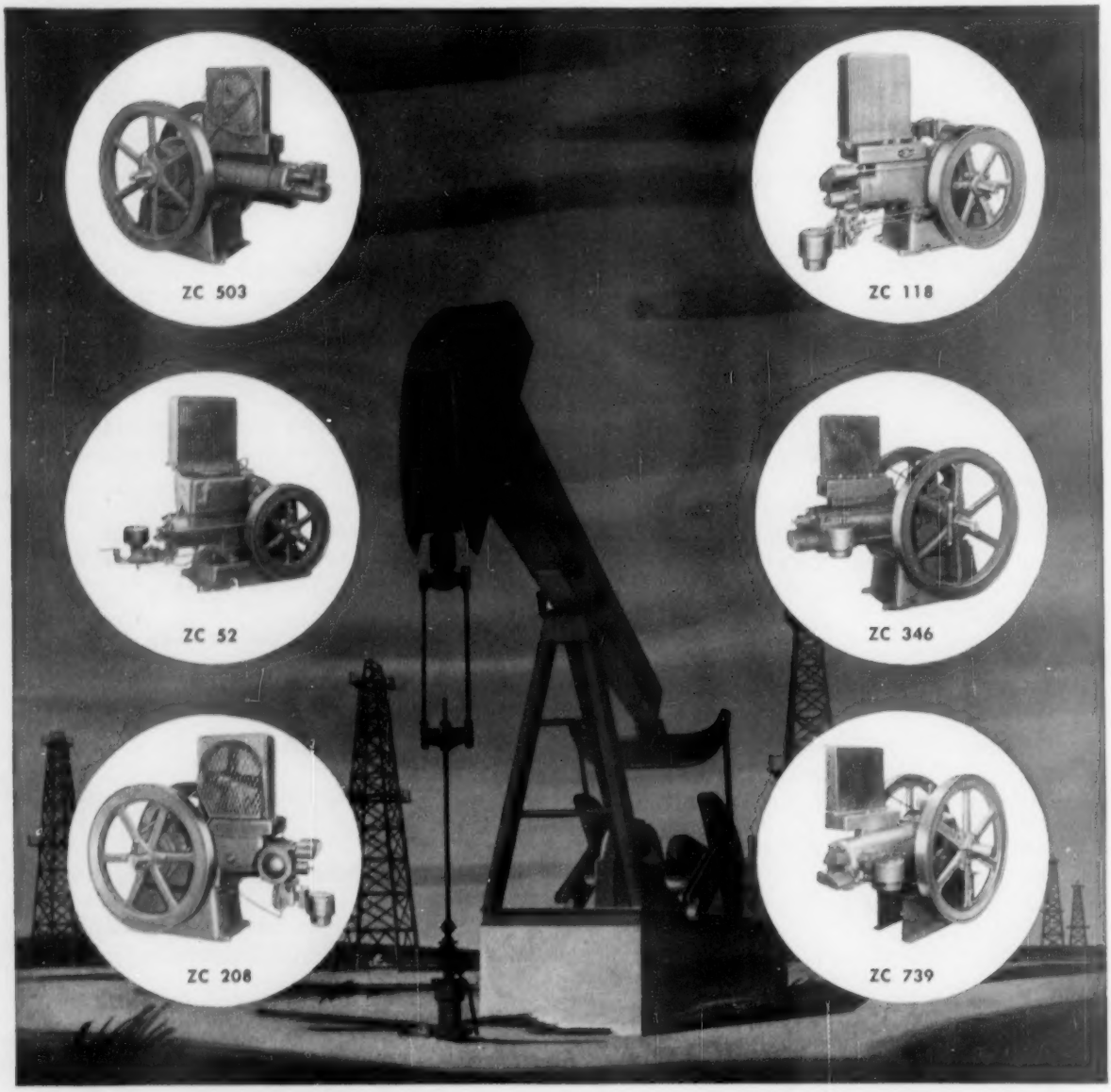

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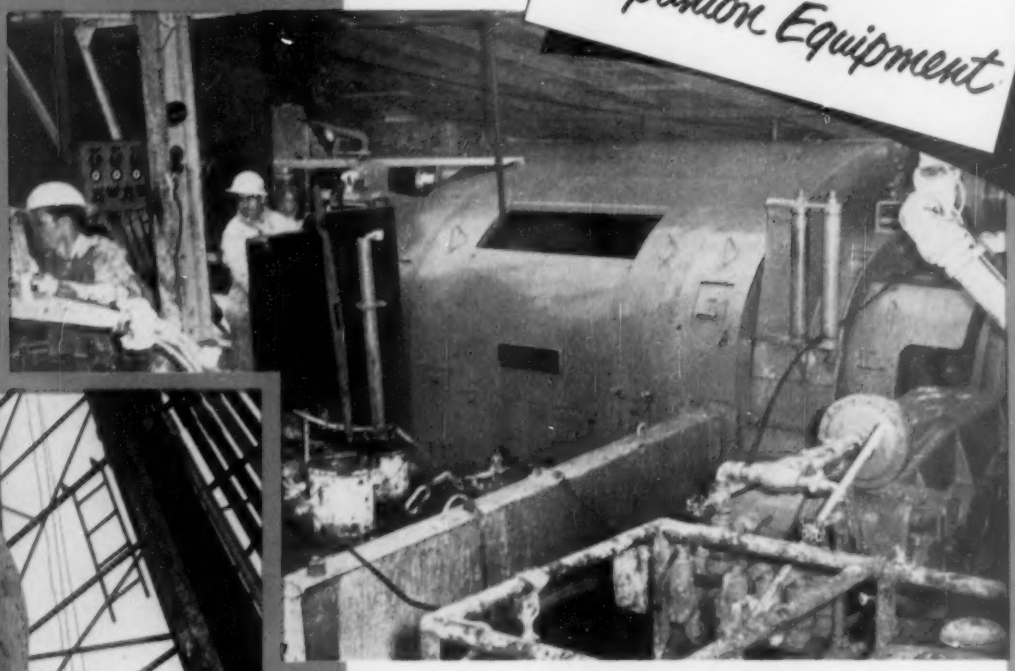

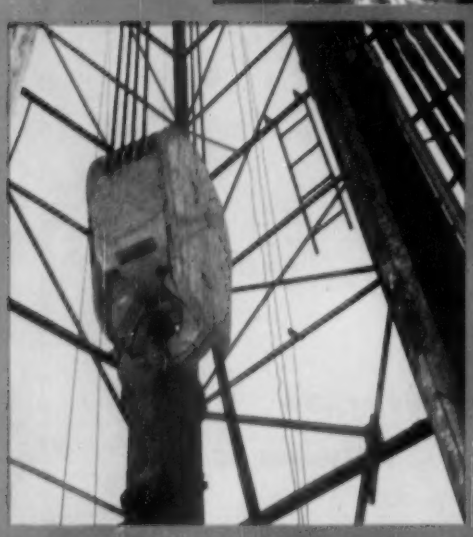

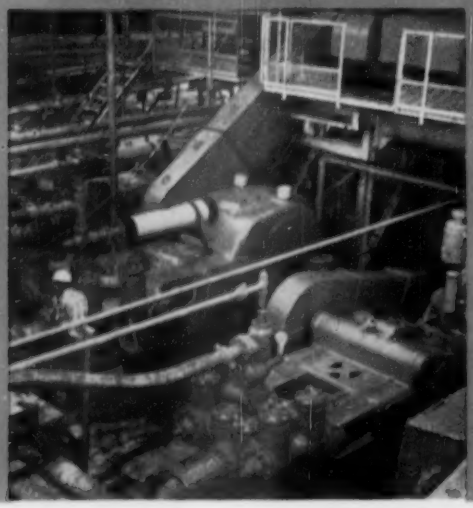

...for drilling the "deep ones"

THIS "Oilwell" No. 96 Draw Works with No. 1,500 four-engine drive was used by Shell Oil Company for their 16,415 ft. producing well recently drilled on Cote Blanche Island on the Gulf Coast.

An "Oilwell" No. 15 Automatic Drilling Control regulated the feed-off from the Draw Works and is shown at the extreme right. Two No. 818-P Slush Pumps were driven from the compound and furnished the mud for jet-bit drilling. A separate engine-driven No. 212-P Pump was used for mud mixing.

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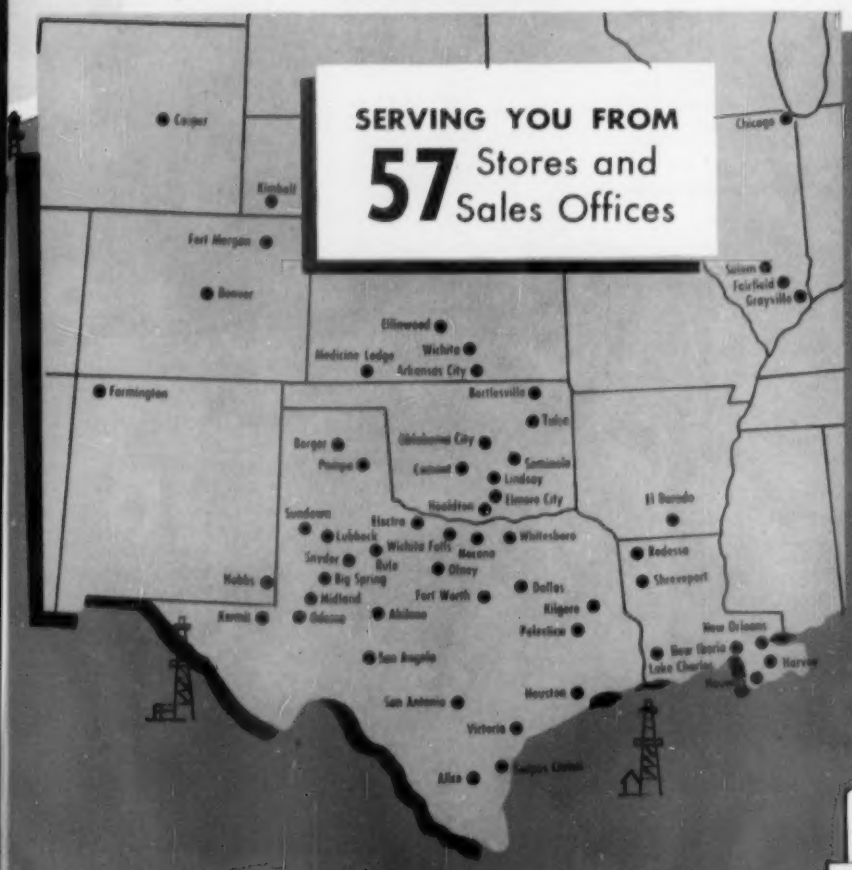

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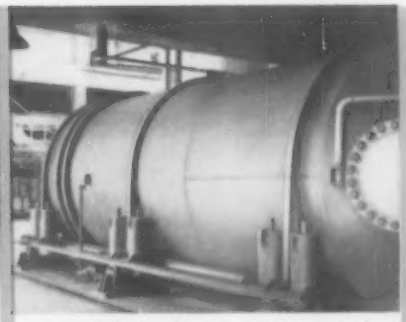

Grinnell Spring Hangers on large vessel of catalytic cracking unit in oil refinery.

Induced draft duct and blower in power station. Operates at about 500°F. Supported by Grinnell Spring Hangers.

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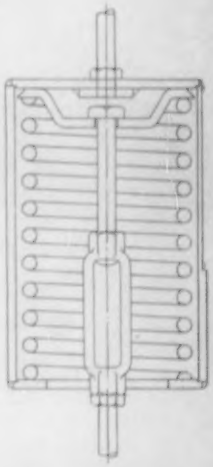

VARIABLE SPRING HANGER FIG. B-268

Fig. B-268, Type A, is designed for attachment to its supporting member by screwing a rod into a bushing in the top cap of the hanger. Adjustment of the hanger load is accomplished by turning the turnbuckle on the lower hanger rod until the hanger picks up the load and the load indicator points to the desired position. Six other types of attachment are available.

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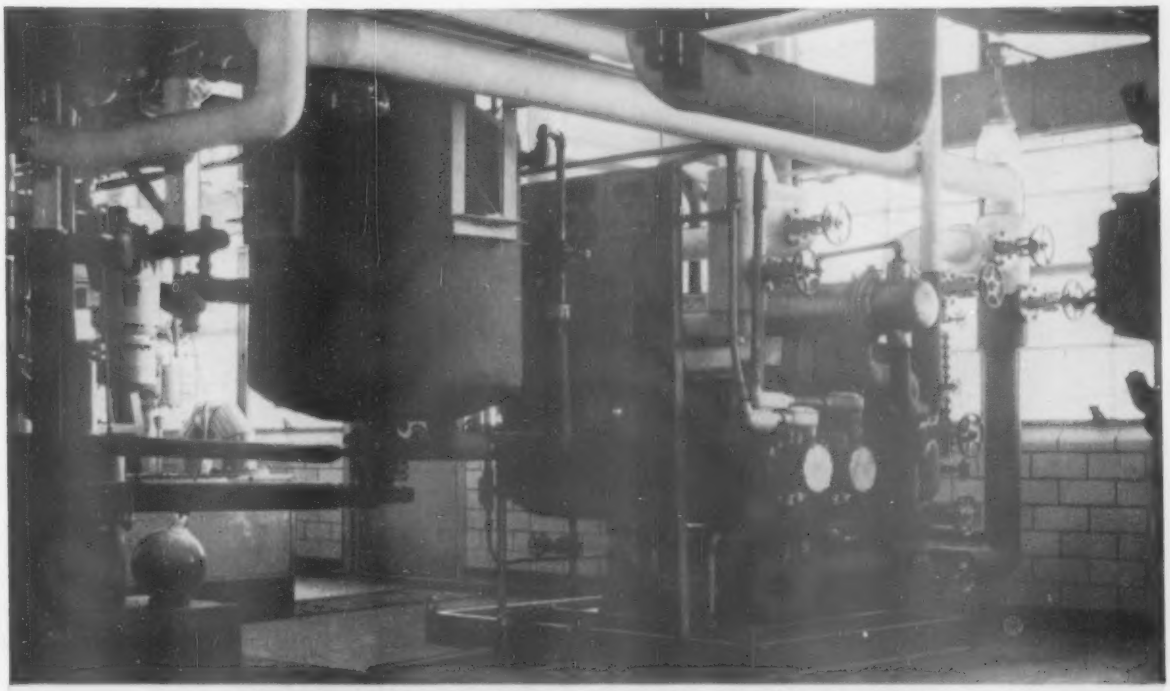

Heating and cooling system in service on process kettle, one of four units installed, for explosion-proof service. (Photo courtesy Kodak Park Works, Eastman Kodak Company)

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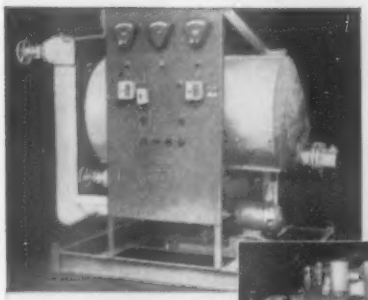
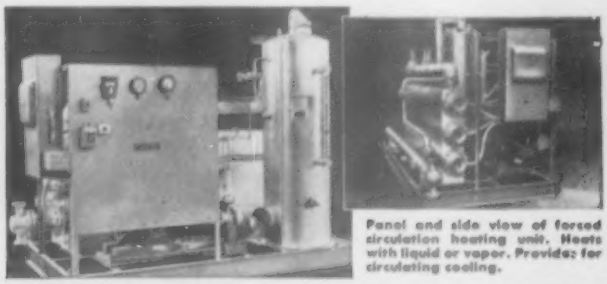


Views of vaporizer type of Dowtherm heater, with pump and capacity tank.



Panel and side view of forced circulation heating unit. Heats with liquid or vapor. Provides for circulating cooling.

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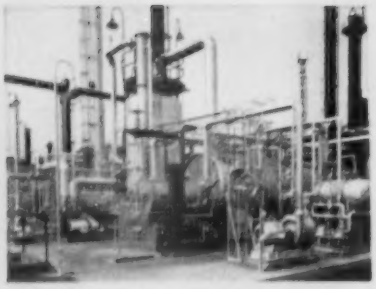

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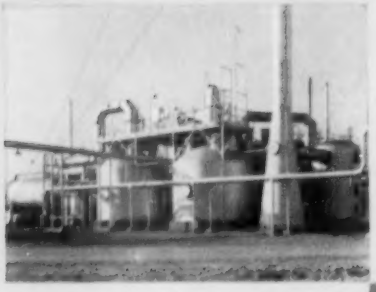
SULFUR PLANTS

by... PARSONS

Contracts for the largest H_2S sulfur recovery plants in the United States, Canada, and Europe have been awarded to Parsons. These new plants further establish Parsons' leadership in this field.



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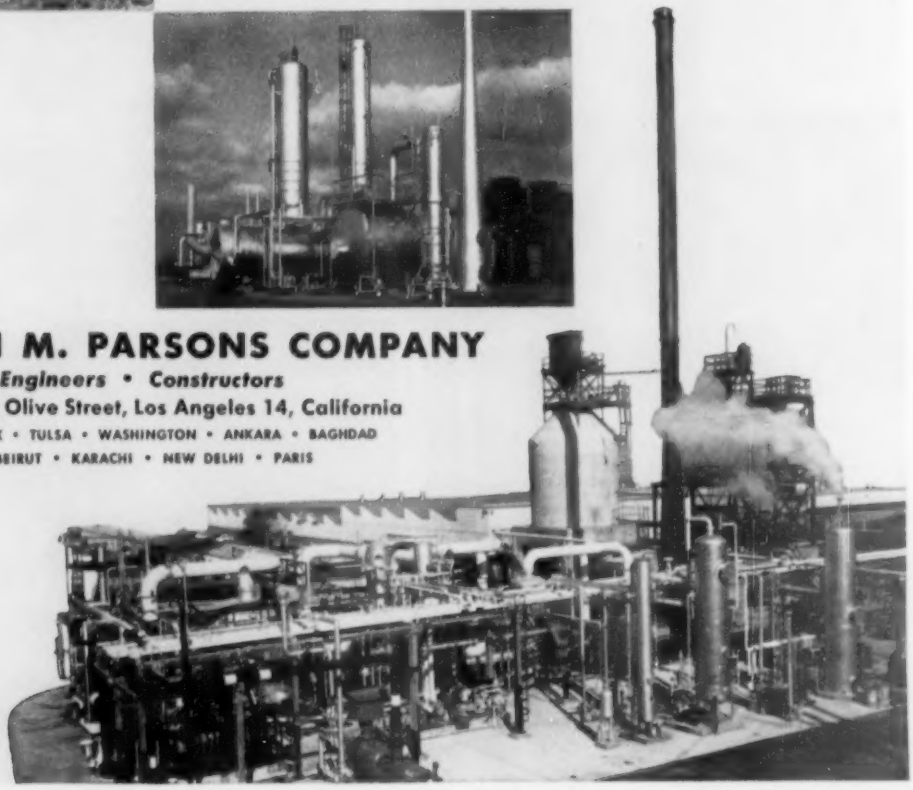
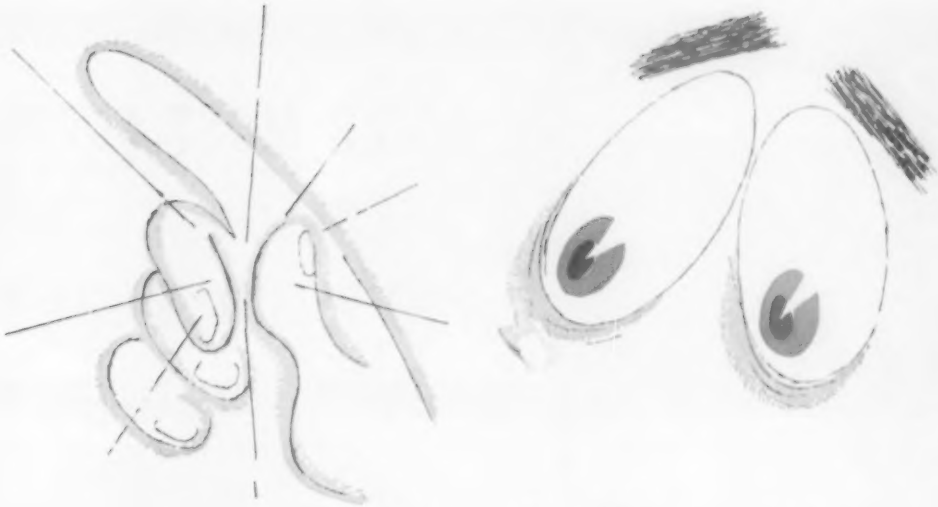
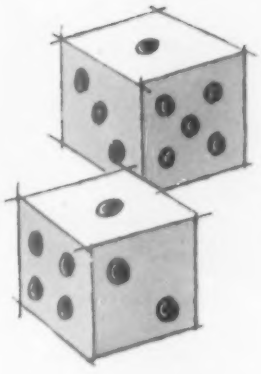






Don't Gamble

on Cement Jobs!

specify

Strata-Crete

® TRADE MARK

6*

You'll give yourself all the odds by using **Strata-Crete 6** on your next cementing job—because the combined light weight and excellent bridging properties of **Strata-Crete 6** cement reduce the loss of slurry to formations and increase your chances of complete fillup. And **Strata-Crete 6** slurries are easily placed at normal pressures, even in slim holes and deep wells. *Strengths of* **Strata-Crete 6**? More than ample. *Uniformity?* Excellent; minimizes occurrence of voids, cracks and channeling. *What about perforating?* Greater resiliency of **Strata-Crete 6** concretes reduces fracturing and shattering with perforation. *Cost?* Here's the payoff! *No greater than the fillup cost of neat cement at most bulk station points.* Write today for your technical data!

Availability of **Strata-Crete 6**? Can be obtained through your oil well cementing service company.

Rocky Mountain sales representative: Mud Control Laboratories, Inc.

*Refers to gallons of water required per cubic foot of Strata-Crete 6.

GLC® **GREAT LAKES CORPORATION**

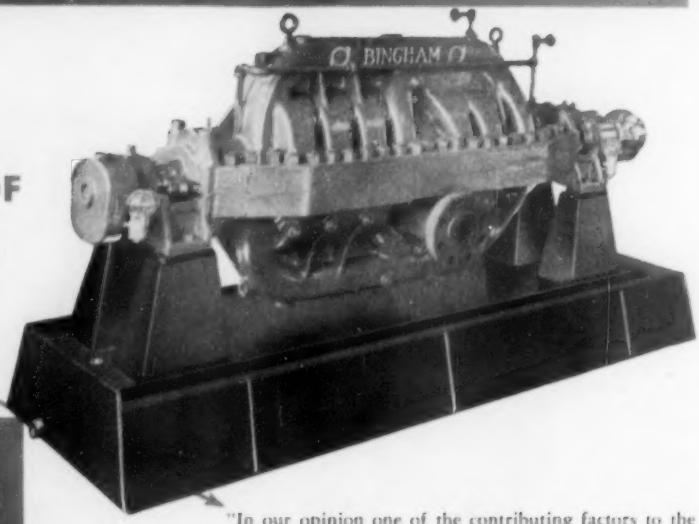
1204 PRUDENTIAL BUILDING

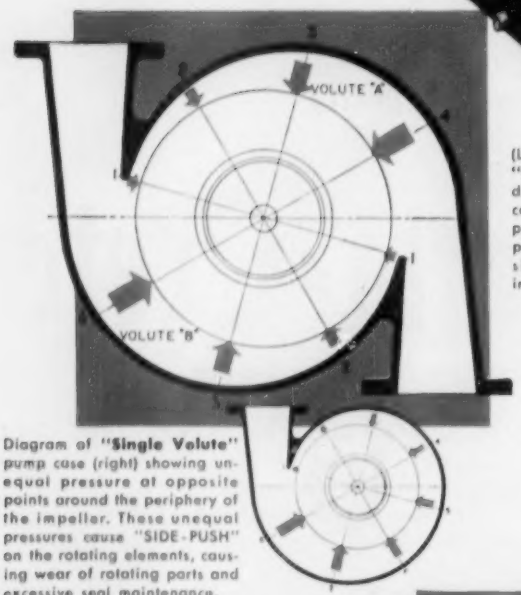
HOUSTON, TEXAS

Bingham "DOUBLE VOLUTE" PUMPS

OFFER MOST FAVORABLE OPERATING CONDITIONS FOR MECHANICAL SEALS

...A PROMINENT MANUFACTURER* OF MECHANICAL SEALS REPORTS:





(Left) Diagram of a **"Double Volute"** double discharge case of a multistage pump showing equal pressures on opposite sides of the impeller.

Diagram of **"Single Volute"** pump case (right) showing unequal pressure at opposite points around the periphery of the impeller. These unequal pressures cause "SIDE-PUSH" on the rotating elements, causing wear of rotating parts and excessive seal maintenance.

"In our opinion one of the contributing factors to the success of our Seals in your Pipe Line type of pumping equipment is your 'Double Volute' design, which insures the rotating element being radially balanced hydraulically throughout the entire operating range of the pump. This feature eliminates shaft deflection which permits our seals to establish and maintain uniform track between the contacting faces. This prevents leakage and seal face wear resulting in *long seal life.*

"The long life and trouble-free service which your pipe line customers are experiencing with our seals in your 'Double Volute' Pumps, speaks well for this style of pump construction as compared to pumps of other designs."

Records of long mechanical seal life is one of the big reasons why Bingham "Double Volute" Pumps are preferred by major pipe line companies. Call your nearest Bingham office for more information . . . or write for "Double Volute" Bulletin.

*Name on request

Bingham SINCE 1921

DOUBLE VOLUTE PUMPS RADIAL BALANCE

BINGHAM PUMP COMPANY

General Offices: **2800 N.W. Front Avenue, Portland 10, Oregon**

Factories: **Portland, Ore. • Vancouver, B.C., Canada**

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BOSTON, MASS.
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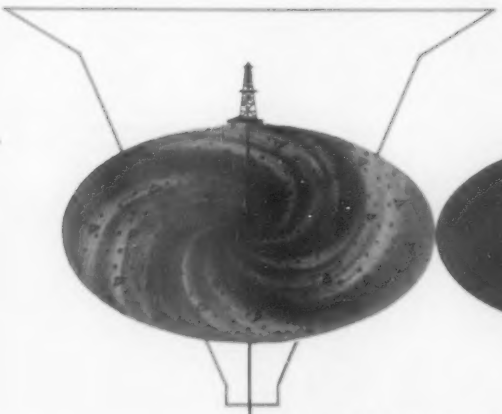


lower strength slurry protects deeper wells

A MODERN TECHNIQUE OF HALLIBURTON CEMENTING SERVICES

Higher pressures, higher temperatures and completions through the producing zones are new cementing problems created by today's deep drilling. To meet these problems, Halliburton research has provided new slurry additives designed for successful cementing in the deepest holes. With proved materials and with advanced equipment, slurries can now be made to fit any given well condition, regardless of depth, temperature or other factors!

One of the most important developments is the lower strength, lighter weight slurries that provide better perforating qualities, more volume per sack of cement and better control of lost circulation. Conventional neat slurries weighing 15 to 16 pounds per gallon can often be replaced with new slurries using such admixes as bentonite and expanded perlites. These low weight slurries—some low enough to permit circulating—provide all the compressive and tensile strength required for successful cementing.

In one area the standard completion practice required multiple stage cementing, perforating jobs and several temperature surveys. By using a lower strength slurry, casing is now successfully cemented with a single primary casing job—and with important savings in time and cost for the operator.

Successful cementing at lower cost, on any depth well, is a Halliburton tradition that goes back more than thirty years. Make sure you receive million job experience, exclusive equipment, proved techniques and new materials by calling for the world's most experienced cementers. Call your local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON

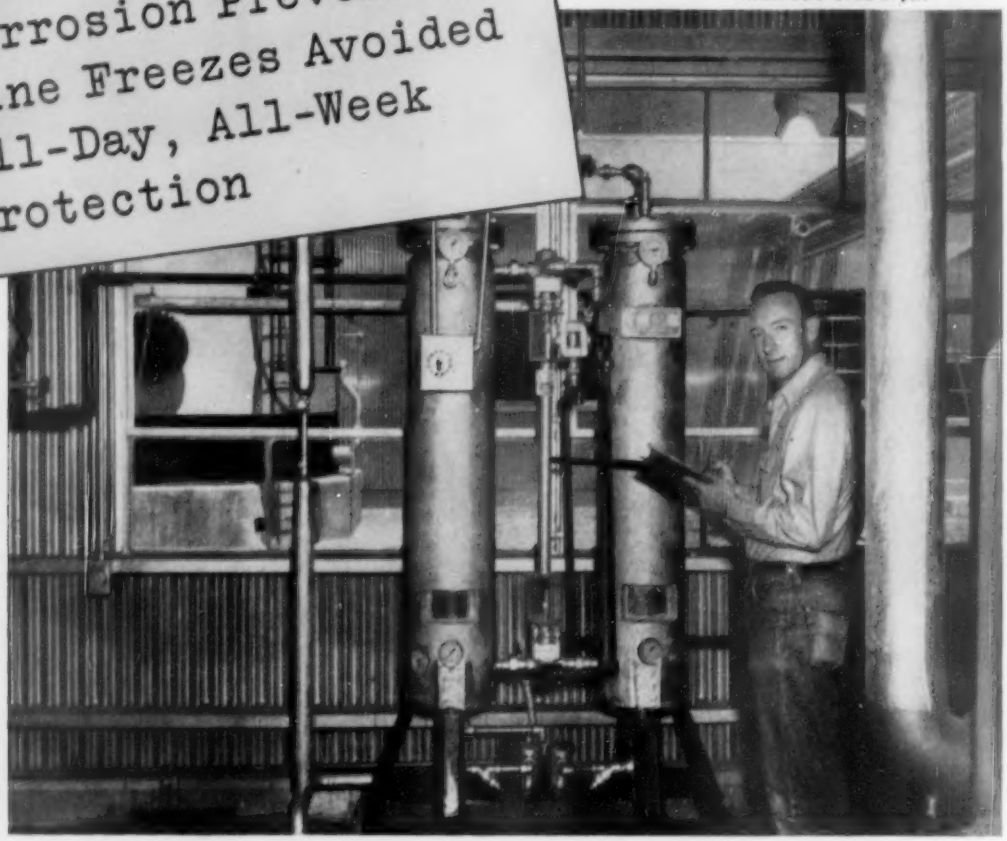
CEMENTING SERVICES

211 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

Case No. 108

Seaboard Oil Company Reports:

- Corrosion Prevented
- Line Freezes Avoided
- All-Day, All-Week Protection



Jerry Rea, plant worker, checks on the trouble-free operation of twin towers comprising Kemp Model 50-S Oriad Dryer.

Sulphur Producer Gets Automatic Drying of Compressed Air with Kemp

During their processing of sulphur and sweetening of natural gas, the Powell, Wyoming, plant of Seaboard Oil Company of Delaware needs large quantities of dried, compressed air to operate complex control instruments.

When their Silvertip Field plant was opened, the operators turned to Kemp to provide this dried air, installing a Model 50-S Kemp Dryer. The machine operates on a manual switching and automatic timing device. Imbedded steam coils reactivate the towers . . . permitting 25 cfm capacity at an exit pressure of 50 psi. The installation is operating 24 hours a day on a seven-day week — preventing corrosion and avoiding costly delays caused by line freezes in the plant.

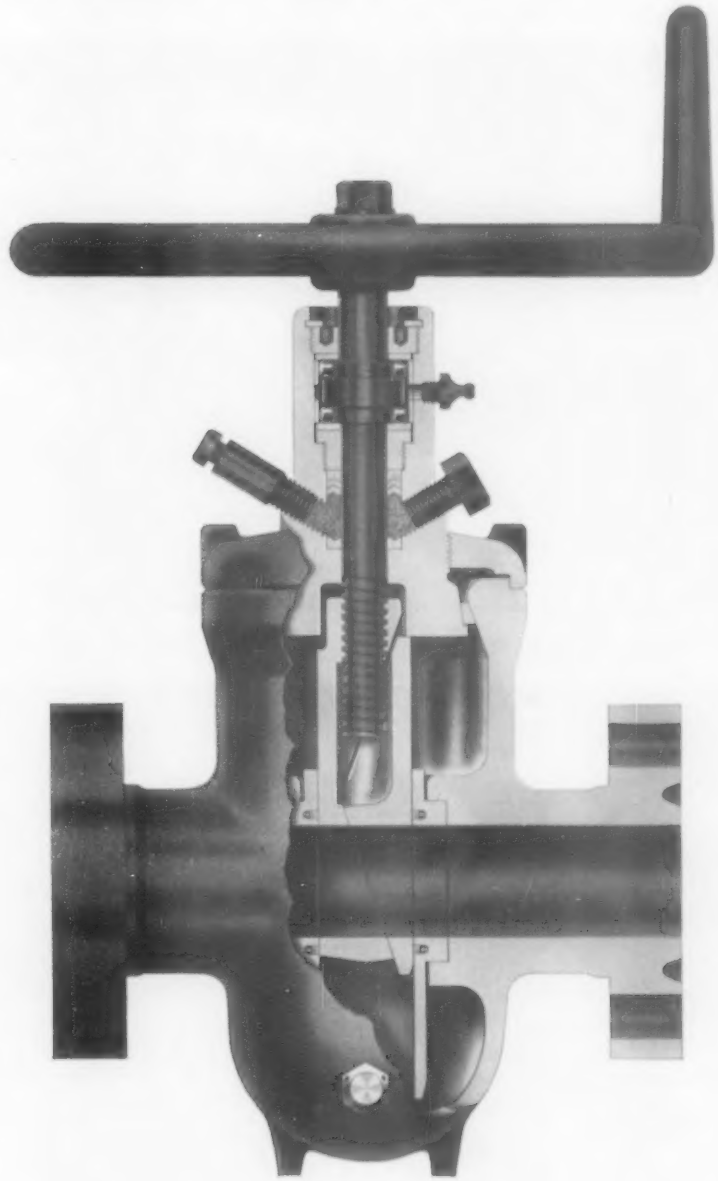
If drying air or other gases is a problem in your operation, it will pay you to discuss your problems with a Kemp Engineer. He can recommend specific equipment to handle your specific problem . . . and give you the benefits of *every* Kemp installation—simplicity of operation and maintenance, low installation cost and minimum maintenance expense. A Kemp Engineer is ready to discuss your needs—without obligation.

For detailed, technical information, ask for Bulletin No. D-29. Write to:
C. M. KEMP MFG. CO., 405 E. Oliver Street, Baltimore 2, Maryland

KEMP OF BALTIMORE

ADSORPTIVE DRYERS

ATMOSPHERE & INERT GAS GENERATORS
SINGEING EQUIPMENT • IMMERSION MELTING POTS
CARBURETORS • BURNERS • FIRE CHECKS



W-K-M VALVES CONTROL MORE THAN 80% OF THE HIGH PRESSURE WELLS IN THE U. S. A.

W-K-M Valves

Wherever you find dangerous or excessive pressures in oil or gas wells, you usually find that control is by a W-K-M Through Conduit Gate Valve.

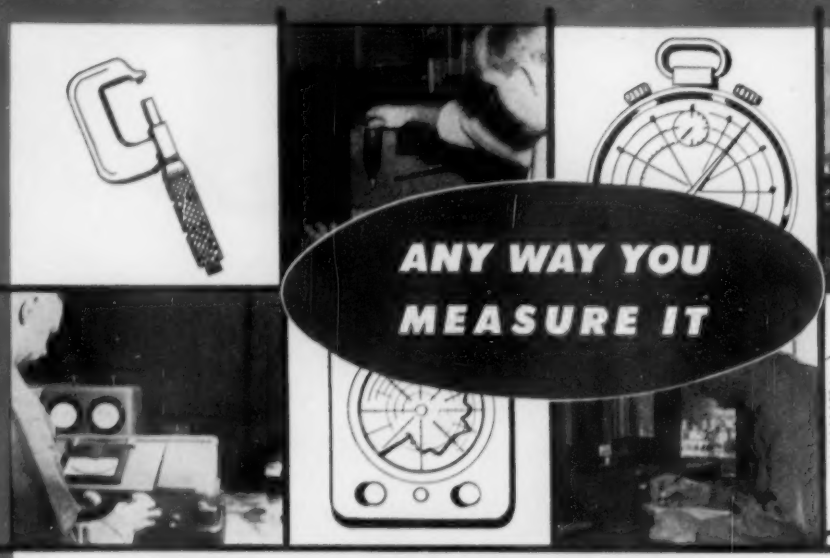
More than 35 years of manufacturing experience plus the excellence of the basic W-K-M design provide security and dependability unequalled by any other valve.

W-K-M MANUFACTURING COMPANY, INC.

A SUBSIDIARY OF ACF INDUSTRIES INCORPORATED

P. O. Box 2117, Houston 1, Texas Los Angeles, California

Export Office: 45 Rockefeller Plaza, New York, N. Y.



ANY WAY YOU MEASURE IT

TRETOLITE PERFORMANCE IS CONSISTENTLY SUPERIOR

TRETOLITE COMPANY
A DIVISION OF PETROLITE CORPORATION
369 Marshall Avenue, St. Louis 19, Missouri
5515 Telegraph Road, Los Angeles 22, California

TRETOLITE'S CONSISTENTLY SUPERIOR PERFORMANCE IS AVAILABLE TO THE INDUSTRY IN PROBLEMS CONCERNING . . .

EMULSIFICATION
Demulsifiers

SCALE
Scale Preventives

CORROSION
Corrosion Inhibitors

BACTERIA (Secondary Recovery)
Bactericide

TRETOLITE SERVICE IS THE KEY TO SUPERIOR PERFORMANCE

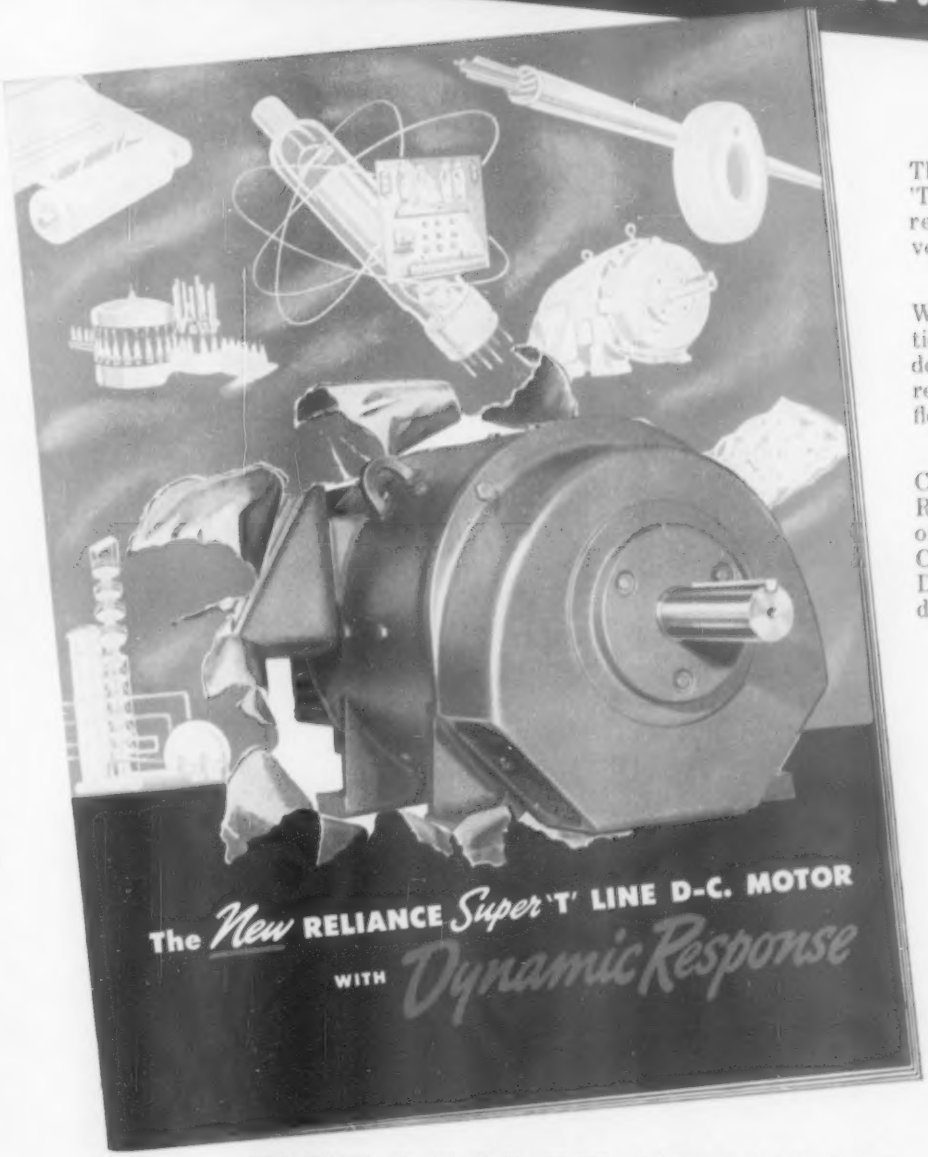
WATER/MUD BLOCKS
Production Stimulator

SALT
Desalting

ASPHALT STRIPPING
Asphalt Additive

POLLUTION
Water De-Oilers

HAVE YOU HEARD ABOUT THE *Revolutionary New Motor* WITH DYNAMIC RESPONSE ?



The *New* Reliance Super 'T' Motor is the most revolutionary motor development in 40 years!

Whatever your application this new motor will do it better, faster—and require less machine or floor space.

Contact the nearest Reliance Sales Office—or write for Bulletin C-2002 which tells what Dynamic Response will do for *you!* C-1098

RELIANCE V★S DRIVE

RELIANCE ELECTRIC AND ENGINEERING CO.

1120 IVANHOE ROAD • CLEVELAND 10, OHIO

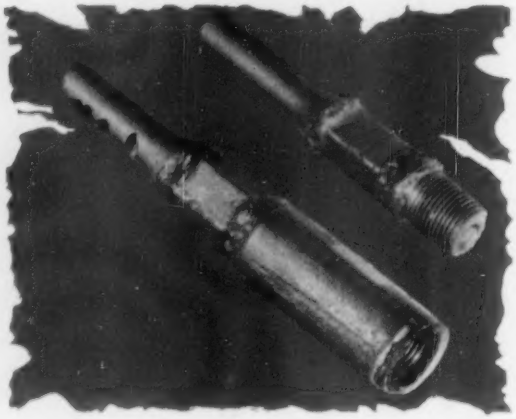
Canadian Division: Welland, Ontario

Builders of the Tools of Automation

RELIANCE Super LINE

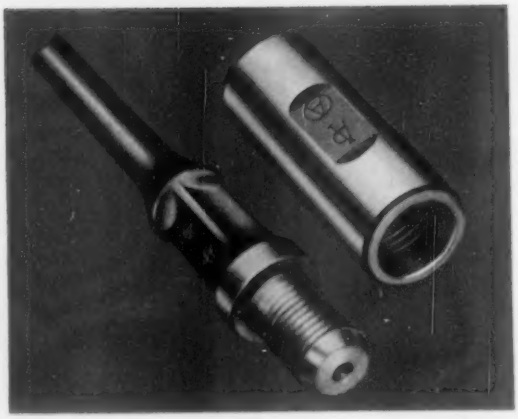
This is trouble...

Trying to increase barrels per day by the trial and error method of rod string selection is a sure-fire way of tossing money down the hole. Pictured is a sucker rod and coupling from a Southern California field. Incorrect specification of size or combination of sizes, improper choice of the type of rod for the well condition caused the failure.



This is trouble-free...

Here's why ..... The wise operator calls in an Axelson field expert who analyzes the well condition. This assures the proper recommendation of both type and size of rods. Add to this the 63 year experience of Axelson in manufacturing petroleum pumping equipment and you have the reason why there are so many remarkable Axelson performance stories.



To be SURE, call an Axelson field expert

AXELSON

Sucker Rods and Couplings

Write for Bulletin No. 5306

AXELSON MANUFACTURING COMPANY • DIVISION OF U. S. INDUSTRIES, INC. • LOS ANGELES 58, NEW YORK 7, TULSA 1, ST. LOUIS 16

GENERAL OFFICES: P.O. BOX 58385 VERNON STATION, LOS ANGELES 58

DISTRIBUTORS—Jones & Laughlin Steel Corp., Supply Division; Great Northern Tool & Supply Company; Jones & Laughlin Steel Sales Co., Ltd., Supply Division, Edmonton, Alberta, Canada; Dominion Oilfields Supply Co., Ltd., Calgary, Alberta, Canada; Adrian Bolland & Cia., S.R.L., Buenos Aires, Argentina, S.A.; Gross Equipment S.A., Lima, Peru, S.A.; Industrial Agencies Ltd., San Fernando, Trinidad, B.W.I.; MAQUIP (Comercial de Marquinas e Equipamentos) S.A., Rio De Janeiro, Brazil, S.A., Servicios Industriales, C.A., Barcelona, Venezuela, S. A.; Servicios Industriales, C.A., Maracaibo, Venezuela, S.A.; Wells Fargo & Co. Express, S.A., Mexico, D.F.; Del Prado & Compania, Ltda., La Paz, Bolivia.

BREWSTER N-12

RESERVE POWERED FOR DEEPEST DRILLING

Compact, rugged and responsive, the Brewster N-12 has been specifically engineered to lower deep drilling costs. Every detail from the finger-tip air controls to the heavy-duty box compound and in-line pump drives has been arranged to provide easy handling and maximum portability. The driller can select from any one of eight hoisting speeds to match the load. Without stopping he can instantly shift from low to high. The graduated speed transmission furnishes four forward speeds and a reverse to the rotary. Full engine horsepower can be used at the pumps while maintaining low table speeds.

Each Brewster N-12 is individually tailored to fit the particular needs of the purchaser. They can be ordered with three or four engine compounds . . . with mechanical, torque converter or fluid coupling engine drives . . . for single or multiple level set-up.

Over-the-road moves have been simplified by designing the rig to move in three road sized packages. Only one chain need be removed to separate the compound and drawworks. The control panel is mounted on the main skid and moves as an integral part of the drawworks package. Engines are coupled to the compound by Fawick air clutches which also serve as quick disconnects when rigging down.

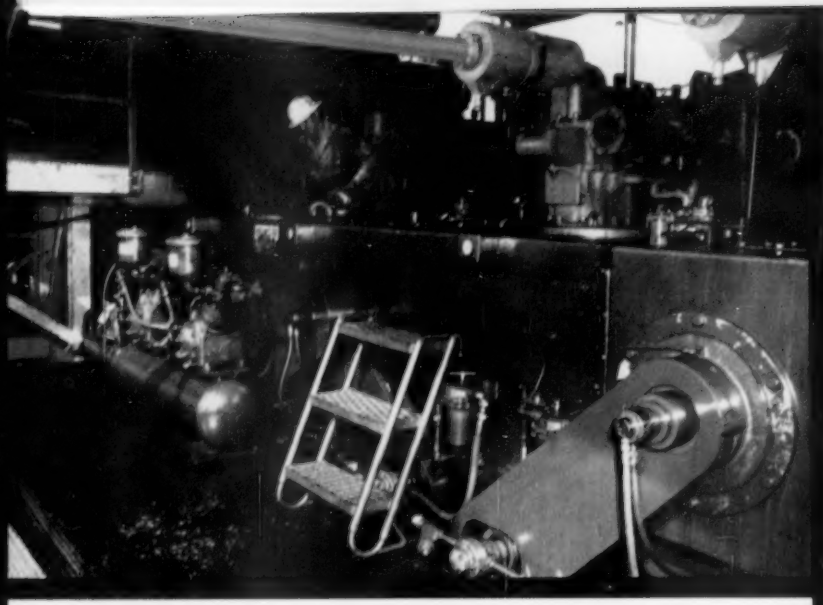
Before you buy get all the facts on the Brewster Reserve Power features that reduce drilling cost on every depth well. Write today —

10,000 FT. AND ON DOWN

THE BREWSTER COMPANY INC.
SHREVEPORT, LOUISIANA

FOR EVERY DRILLING DEPTH

N-12 DRAWWORKS



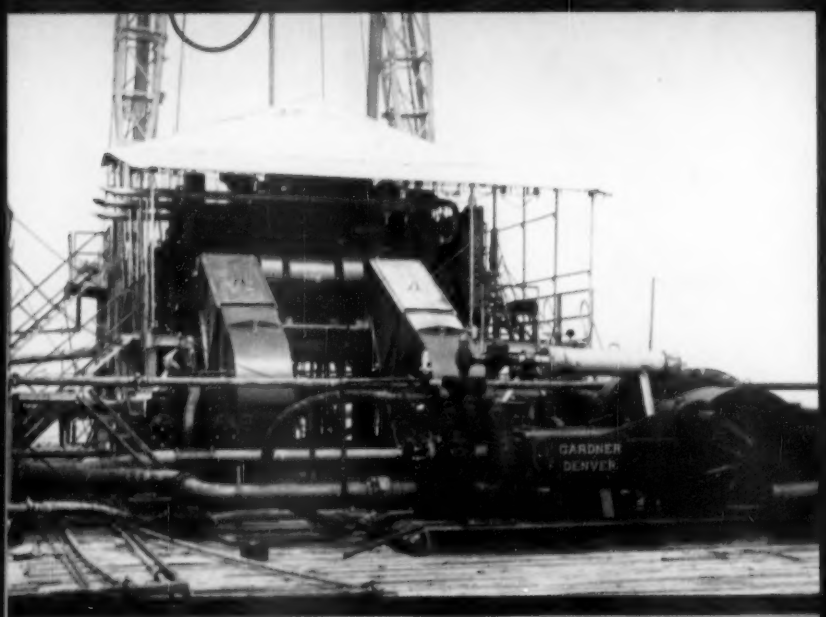
BREWSTER N-12

SPEED DIAGRAM

SPEED	LINE SPEED FPM	LINE PULL LBS.
1	359	124,400
2	501	89,300
3	691	64,600
4	953	47,200
5	1,333	33,600
6	1,850	24,300
7	2,578	17,300
8	3,590	12,400

Line speed and pull based on 1500 H.P./83.3% efficiency.

BOX TYPE COMPOUND—The heavy duty box-type compound can be furnished for three or four engine drive. Large inspection plates provide easy access to all elements. Bearings and shafts are lubricated by a positive pressure system that uses separately driven oil pumps to assure a constant supply of clean oil.



DUAL PUMP DRIVES—In-line pump drives at the rear of the compound simplify rigging up and manifolding—eliminate the need for idlers or notching the substructure. Individual controls permit them to be used singly or together at the same or different speeds.

BREWSTER MATCHED EQUIPMENT FOR THE N-12 INCLUDES:

Brewster 500-ton heavy-duty traveling block. Equipped with Timken tapered bearings, available with five or six sheaves grooved to match your crown block.

Brewster 8-S oilbath swivel. High capacity design with tapered main bearing and Brewster's patented "quick change" packing cartridge.

Brewster RSH-22 oilbath rotary table. Completely mud-proof, the RSH-22 is equipped with top and bottom mud seals. Separate lubrication, oil bath for main gear and bearing and alemite for pinion bearings, assures maximum all-weather protection.

SUPPLY HOUSES

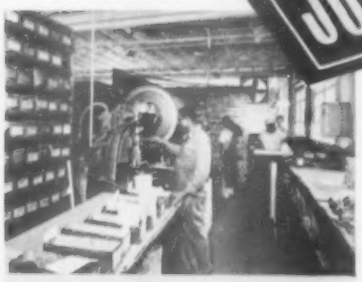
Howard Supply Company • Apex Equipment Company • Bovaird Supply Company Industrial Supply Company • Murray Brooks, Inc. • Reams Supply Company For Canada, Mexico and Export Sales: The Brewster Company

THE BREWSTER COMPANY, INC.

OPERATIONS TEXAS...

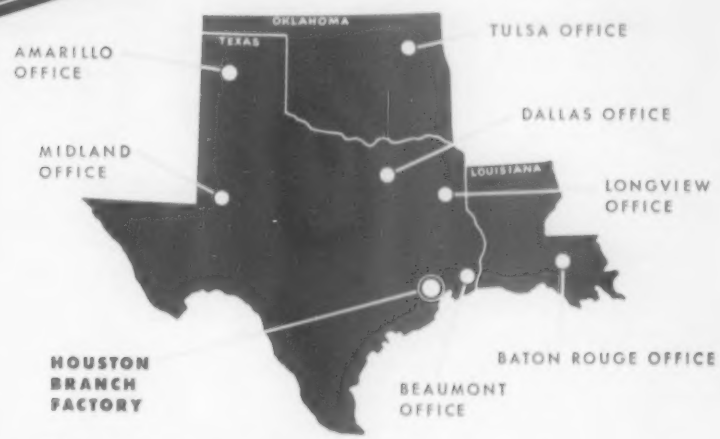
JOHN CRANE

Houston branch factory is conveniently located outside downtown area. Fifteen qualified employees are ready to serve you. Over 12,000 sq. ft. house manufacturing, stock and complete service facilities.



Packings are available in all styles, types and sizes. Shown here is the ring department using assembly line method to produce die-formed rings.

Here is the largest stock of mechanical seals and mechanical seal parts in the Southwest. All items are ready for immediate shipment.



Complete Service in the Heart of the Oil Country

Mechanical seals...mechanical packings...PLS pipe thread compounds...Teflon* products ...Lapmaster lapping machines and lapping service...as near to you as your telephone.

"John Crane" facilities and service are available from branch offices located throughout the rich oil producing areas of the South and Southwest. Hub of the "operation" is the completely stocked branch factory at Houston, Texas.

Whatever your requirement...whatever your problem...call your nearest "John Crane" representative for prompt service and the results you want.

Remember: ***Your toughest problem can be "John Crane's" next success story.***

CRANE PACKING CO., 6626 SUPPLY ROW, P. O. BOX 9411, HOUSTON 11, TEXAS

*DuPont trademark

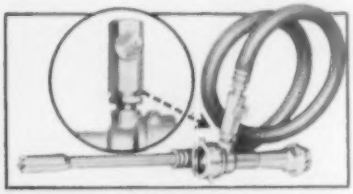
JOHN CRANE **CRANE PACKING COMPANY** 30 YEARS INDUSTRIAL PROGRESS

Home Office: 1819 CUYLER AVENUE, CHICAGO 13, ILLINOIS

The FW Eductor is a *discharge* side proportioner. Comes in 1½" and 2½" sizes. They operate efficiently on pressures ranging from 75 to 175 p.s.i. at the Eductor inlet.

FFF Nozzle comes with Foam screen and solid Foam stream shaper.

Rockwood Eductors are designed for use with both the Rockwood FFF nozzle and the SG-60 nozzle with FF extension unit. SG-60 is an all-purpose nozzle that fights fires 5 ways — high velocity WaterFOG, low velocity WaterFOG (with applicator), FogFOAM, solid stream of water or of FOAM. FF extension unit discharges Rockwood FOAM in a solid stream or as FogFOAM, and covers large areas at one time.



The Variable FW Metering-Check Valve on the Rockwood Eductor is highly versatile, and is furnished with each FW Eductor. It incorporates both the Metering Valve and Ball Check Valve in one unit, and meters material into the hose line in any proportion from 1% through 6%.

One for the road!

Protect against flammable liquid fire due to tank truck accidents

With more traffic on congested highways, more filling stations, more and more gasoline tank trucks in daily service, *your* city is in greater danger of a flammable fuel fire than it has ever been before. A sudden crash of a tank truck passing through your city streets tomorrow could confront you with a difficult-to-control flammable liquid fire.

The use of Rockwood FW Eductor reduces the danger of disastrous losses due to such a fast-spreading fire. Developed for operation with Rockwood's FFF nozzle and SG-60 nozzle with FF extension unit, the FW Eductor introduces Rockwood regular FOAM, Double-Strength FOAM or WET (1% or 2%) into the hose line, quickly controlling and extinguishing flammable liquid and other fires.

Rockwood FW Eductor is the simplest form of proportioning you can buy. Ideal for municipal fire departments, oil refineries and industrial plants, it can be attached between discharge gate of a fire truck and hose line, or between hydrant and hose line, or between two lengths of hose.

Be prepared. Put this great fire fighter to work for you. Specify Rockwood FW Eductor when you order a fire truck.

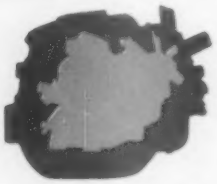
Rockwood Double-Strength Foam Liquid, 3 parts mixed with 97 parts water, forms a solid FOAM blanket that quickly re-seals itself. Available in 5-gallon or 50-gallon drums.

Rockwood WET, 1 part mixed with 99 parts water, increases penetration and extinguishing action of water. Excellent for deep seated fires or where water is scarce. Can be used in proportions of 1% or 2% by volume for Class A and B fires. Available in 5-gallon cans or 50-gallon drums.

ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

PORTABLE FIRE PROTECTION DIVISION • 1061 Harlow Street, Worcester 5, Mass.



"Things are not always as they seem"

Even in the oil fields where most everything comes "king size," bigness may not always be desirable. Take power . . . there are probably 101 different jobs in Petroleum now using big, ponderous, slow-speed engines that could better use compact, higher-speed industrial power — the kind that Chrysler Industrial V-8 Engines can supply.

Chrysler Industrial V-8 Engines cost but a fraction of the cost of big slow-speed engines . . . to buy, to install, to operate and to service. Parts replacement is fast, easy, and at a fraction of the cost of replacing the same parts of the large unit.

Sound incredible? It's all true and let's see why. Modern Chrysler Industrial V-8 Engines are designed, engineered and built to operate at high speeds—speeds one and a half to two times faster than big, old-style, slow-speed engines. But, the bearing surfaces and reciprocating parts in a Chrysler Industrial V-8 Engine move no faster, are subject to no greater wear than are the moving parts in the big slow-speed engine. It's a fact, and the answer lies in the *oversquare* construction of Chrysler Industrial V-8 Engines.

By oversquare engines, we mean engines whose bore diameters materially exceed the length of their stroke. Chrysler Industrial V-8 Engines are oversquare, and the resulting short stroke reduces piston travel considerably, permitting pistons and all moving parts to operate at unbelievably slow speeds.

Then too, Chrysler Industrial V-8 Engines are built around the famed Chrysler Hemispherical-Design Combustion Chamber. This combustion chamber — exclusive with Chrysler Industrial V-8 Engines — is recognized as offering the most efficient fuel combustion of any internal combustion engine on the market today.

THE END RESULT — and the important thing to remember when you consider Chrysler Industrial V-8 Power for 101 jobs in Petroleum — is you get a smaller engine, an engine or power unit that is easier to move from one job to another, an engine that not only will do as much work as the big, *long-stroke*, slow-speed engine, but also an engine that costs much less to buy, to install and to operate.

Give serious thought to installing Chrysler Industrial V-8 Power the next time you need an industrial engine for stationary or mobile application. And remember, Chrysler Industrial V-8 Engines are finely-balanced, smooth-running engines, constructed of finely-alloyed lightweight metals, precision manufactured to meet the highest standards in the industry.

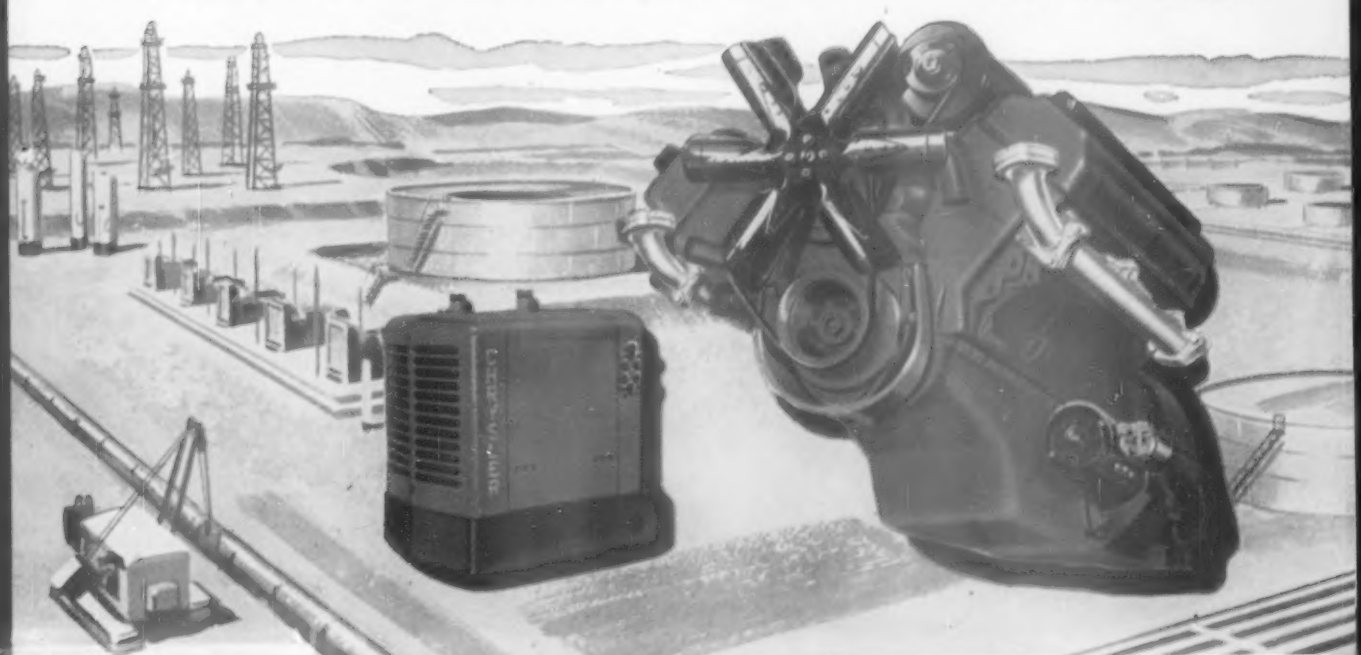
Remember too, in specifying Chrysler Industrial Power you pick engines that are factory-equipped for your requirements. For example, you may specify engines equipped with gasoline, butane or natural gas burning carburetors; velocity, belt or gear-driven governors; heavy-duty clutch and power takeoff; 3, 4 or 5-speed transmission; Chrysler gyrol Fluid Coupling or Chrysler Industrial Torque Converter. Open and enclosed power units come skid-mounted as part of their standard equipment.

A factory representative will be glad to discuss Chrysler Power with you, or you may prefer a catalog on all Chrysler Industrial Engines. Address either request to: ***Dept. 156, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.***

CHRYSLER Industrial Engines

INDUSTRIAL ENGINE DIVISION • CHRYSLER CORPORATION

HORSEPOWER WITH A PEDIGREE



BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second St., Tulsa, Okla.
West Coast Headquarters: Los Angeles, Calif.
Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York, N. Y.

The M-58...The M-810

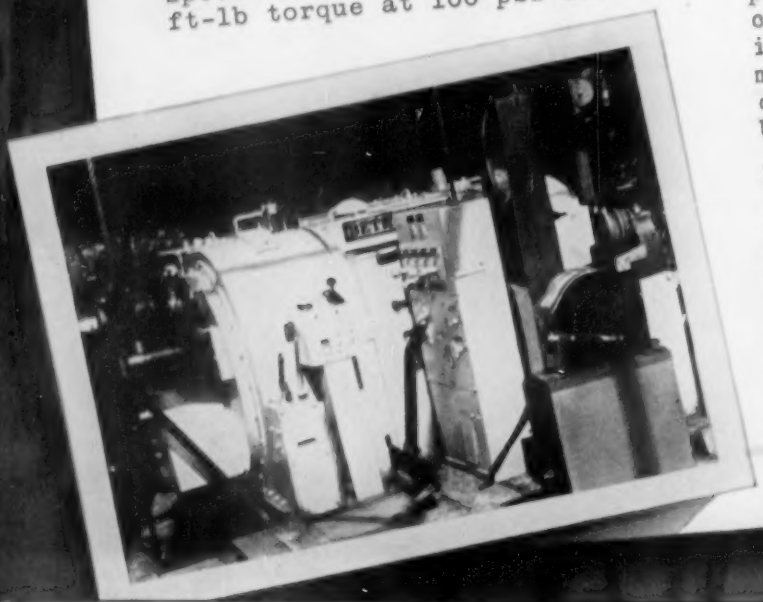
TWO GREAT RIGS WITH POWER TO SPARE
mean faster drilling at lower cost

Bethlehem's M-58 and M-810 - for medium and medium-deep drilling, respectively - are two of the huskiest rigs ever developed. Each is a leader in its class. Each rates an honor mark for field performance.

Though different in size, the units are built along the same general lines, with ruggedness emphasized. Both have capacity far in excess of the usual needs. Some of their features are as follows:

M-58

Has tremendous clutch capacity for a unit of this size (low-speed drum clutch, 59,000 ft-lb torque at 100 psi air pressure). Rig is equipped with oversized brakes, short, strong shafts, heavy chains. Engine compound is of sectionalized type so that rig can be broken down into loads of required road widths. Drives available: mechanical, fluid-coupling, or torque-converter. Upper drum optional.



M-810

This unit, too, has amazingly high clutch capacity (low-speed drum clutch, 102,000 ft-lb torque at 100 psi). Another feature is the powerful 52-in. brakes that provide extra safety in all situations. Rig can be furnished with two- or three-engine drive having single or double pump drive; pump drive is Airflex-clutch-controlled. Engine compound is sectionalized. Choice of mechanical drive, fluid coupling, or torque-converter. Upper drum optional.

Both these rigs merit careful study. If you compare them, point by point, with competitive outfits, you're bound to be impressed with their all-around capacity and ruggedness. Call, wire, or write our nearest office for full details.

Why more LINK-BELT API (SS type) chain is used than any other brand

CADMIUM-PLATED PINS

The finish on these pins prevents rust, avoids corrosive fatigue in these flexing members. Link-Belt chain pins go into service in factory-finish condition no matter how long they've been stored.

It's built and packaged for the toughest jobs. And it's available at leading supply stores . . . everywhere!

YES — from every angle — Link-Belt's API chain (SS type) leads the field. Starting in with the manufacture, Link-Belt takes extra steps to assure longer chain life. And these "extras"—like the ones shown here—are *standard* on every length of Link-Belt API.

In packaging, too, Link-Belt gives you more value. Steel-banded *double* box keeps out even the finest sand . . . stands up in the wettest weather without wilting.

As for availability, you'll find Link-Belt chain at leading supply stores in your field. And Link-Belt warehouses back them up to serve drillers promptly . . . *everywhere.*

Book 2580 gives complete information on Link-Belt's quality equipment for the oil fields. Ask for a copy today.

FOUR OF MANY "EXTRAS" YOU GET AS STANDARD ON LINK-BELT API CHAIN

GRINDING pins *and* bushings (all contact surfaces) to a fine micro-inch finish eliminates wear-producing surface irregularities.

SHOT-PEENED rollers have been hammered by tiny steel balls—creating added ability to withstand shock and impact.

COTTERS have patented grooved shank affording tight fit in pin hole. Yet pin is easily removed or inserted. Cadmium plated.

MORE CONVENIENT, TOO! Link-Belt packs its oil field chain in dustproof, sturdy boxes for easy handling, quick identification.

LINK-BELT

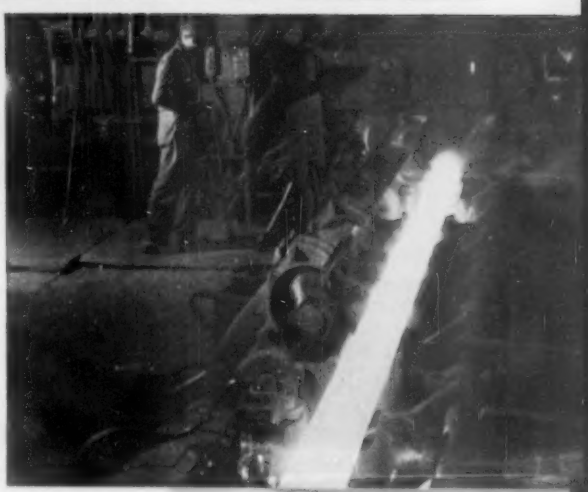
CHAINS and SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.

In the deep wells . . . where you'll always

HIGH STRENGTH is a "must" in deep well drill pipe and casing. And the very ultimate in strength is found in Seamless products. That's why all drill pipe, practically all tubing, and a very large portion of the casing made today are made by the Seamless process.

NATIONAL Seamless Oil Country Tubular Products not only have the strength and collapse resistance to meet the fatigue and twisting stresses of today's deep wells—they are being continually improved to withstand the unknown depths of tomorrow. Deep hole drillers know from experience that



▲ **One of the World's Deepest Producing Wells**—Shell Oil's Gonsoulin-Minvielle State Unit No. 2 at Weeks Island Field, Louisiana was drilled to 18,568 feet—with no difficulties encountered. 4,200 feet of NATIONAL N-80 Buttress-Thread Casing were used at the top of the string to support another 14,000 feet of 9⅝ inch casing.

Where Strength Starts—The Seamless Method is one of the most difficult forging operations in the steel industry. Only steel of the very best forging properties and of high uniformity can be used, since piercing the solid billet tends to search out any defects in the metal. ▶

STRENGTH is most important find NATIONAL SEAMLESS

they can work NATIONAL Seamless hard and deep, with complete confidence . . . now and in the future.

Here are some significant National Tube Developments in the oil and gas industry:

NATIONAL DEOXIDIZED BESSEMER STEEL CASING AND TUBING—GRADES H-40, J-55

Especially well-suited for oil production because of its combination of high yield strength and good ductility.

NATIONAL WARM-WORKED CASING—GRADE N-80

An extremely high-strength casing possessing a uniformity of physical properties which gives it high collapse resistance and greatly increased joint strength, hydrostatically tested to 80% of minimum yield strength up to a maximum of 10,000 p.s.i.

NATIONAL DEEP-WELL CASING

A stronger casing than is provided under A.P.I. specifications, to meet constantly increasing depths. Because it is intended for severe service it is hydrostatically tested to 80% of minimum yield strength up to a maximum of 12,000 p.s.i.

NATIONAL (B) BUTTRESS-THREAD CASING

Developed to satisfy the need for a casing joint which will safely and economically support the weight of deep-well casing. The buttress-thread joint is comparable in strength to that of the body of the pipe.

For complete details on NATIONAL *Seamless drill pipe, casing and tubing, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.*

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

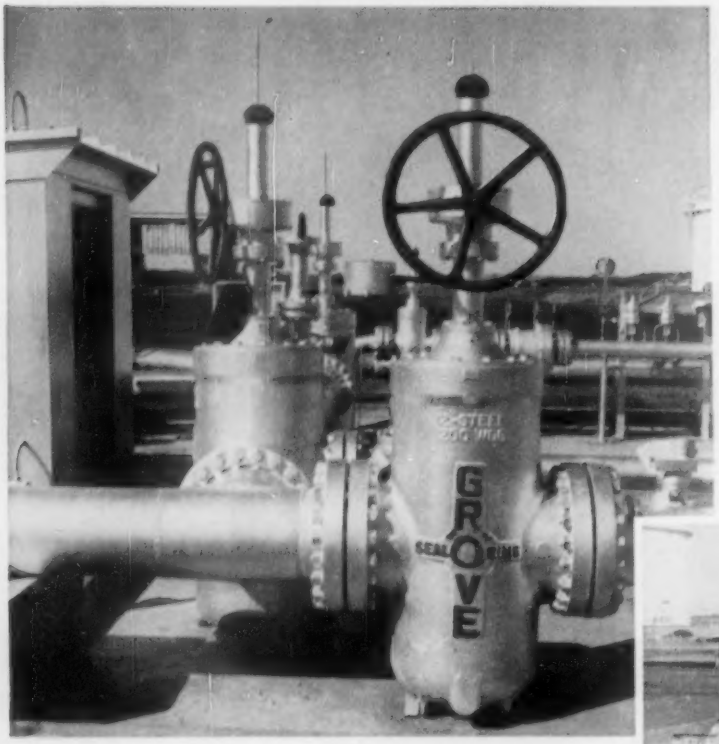
USS NATIONAL SEAMLESS PIPE AND TUBES

USS

UNITED STATES STEEL

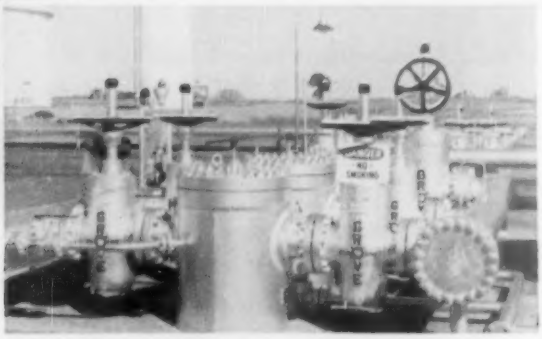
piercing the solid billet tends to search out any defects in the metal.

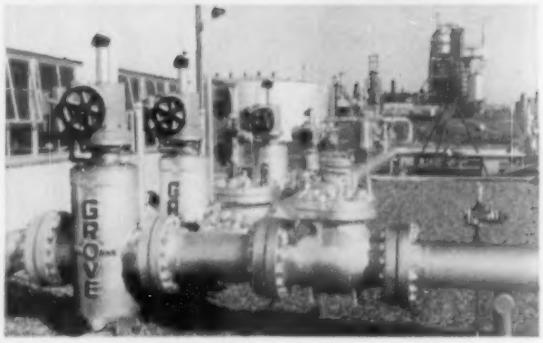
Over 175 Grove Seal-"O"-Ring Gate Valves on major products pipeline...



provide dead-tight seal...without lubrication or sealing compound!

- NO PRODUCT CONTAMINATION
- NO LUBRICATION SERVICE PROBLEMS





Over 175 Grove Seal-"O"-Ring Gate Valves are in operation on the Oklahoma Mississippi River Products Line extending from Duncan, Oklahoma to West Memphis, Arkansas. Illustrated here are some of the varied applications at the Duncan and Fort Smith stations.

Particularly important on product lines is the fact that Grove Seal-"O"-Ring Gate Valves maintain dead-tight seal and full freedom of operation without lubricants or sealing compounds which might contaminate products. For the full story on Seal-"O"-Ring Gate Valve performance . . . available from 2" to 36" sizes . . . for products, gas, or crudes . . . contact your Grove representative today.

408

GROVE SEAL-"O"-RING Gate Valves

GROVE VALVE and REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California
HOUSTON 4 — 1901 Calumet St. • • • • • • • • LOS ANGELES 6 — 1930 W. Olympic Blvd.

ODESSA, TEX. • TULSA, OKLA. • LAFAYETTE, LA. • CHICAGO, ILL. • DENVER, COLO. • In Western Canada: GROVE VALVE LIMITED

GROVE SEAL RING GROVE SIMPLICITY ACCURACY SAFETY

NATIONAL'S SUPPLY SERVICE GOES TO SEA, TOO!

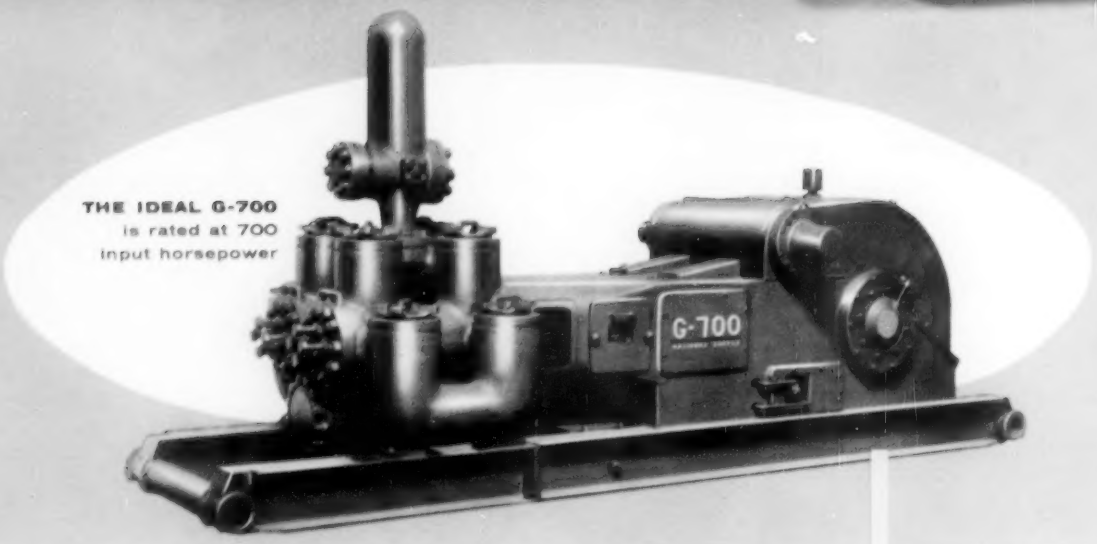
When you're drilling off-shore, alert and dependable supply service is a must for efficient operation. Nobody realizes this better than the many National Supply representatives who have acquired "sea legs" to serve their customers.

Our Gulf Coast store managers report that it takes a special kind of supply service to meet their off-shore customers' needs. Filling the "want lists" requires careful planning and timing, as well as plenty of experience in anticipating regular and emergency operating supply problems. Except for the customers' locations on water, however, these requirements are not new for National men.

Wherever they drill for or produce oil, operators always need dependable service and equipment. That's why you'll find National representatives and products in action in all of the free world's major oilfields. We've furnished much of the major drilling equipment for over half of all America's off-shore installations—and we're following up with the kind of supply service that helps to insure profits for its users. National men and products team up with operators to conquer jungle, sand, monsoons, blizzards and countless other hazards at the end of long supply lines.

Locations and conditions change, but the quality of National's supply service is always the same—whether you're at sea or on land, and 4 or 4000 miles away from the nearest National store or plant. Our thousands of satisfied customers recognize this fact . . . and it is their confidence in it that keeps National Supply the oil industry's largest supplier.

THE
NATIONAL SUPPLY
COMPANY



THE IDEAL G-700
is rated at 700
input horsepower

NEW IDEAL® "G SERIES" SLUSH PUMPS

provide high velocity and volume for jet-bit and deepest drilling!

If you have high fluid pressure or volume needs on your drilling jobs, you can confidently meet them with National's new "G Series" slush pumps. Developed especially for mud circulation in deep wells, the heavy-duty G-700 and G-1000 have the capacities and advanced design features that keep costs low on the big, difficult jobs.

These pumps give you ample volume and pressure for every jet-bit or deep well drilling job you can encounter. And, like *all* Ideal Slush Pumps, they're built for dependable service, with many mechanical and hydraulic features that insure sound performance, easy maintenance and long life.

Their rugged power ends include such features as pre-loaded main and connecting rod bearings,* mounted independent of the frame to reduce impact loading, hardened single helical gears and gear splash and cascade lubrication systems. Their fluid ends—one-piece steel castings with no internal baffles—feature improved stuffing boxes and large, direct suction passages, smoothly curved for minimum resistance to fluid flow. Their unitized frames are designed and built to insure a minimum amount of deflection, with resulting maximum frame strength, and all working parts are easily accessible.

All of these features, backed by National's 40 years of experience in mud pump design and construction, add up to maximum performance and maximum pump life under a wide variety of operating conditions. The National Supply representative in your area can show you more—and tell you why they mean new profits on deep well jobs. See him soon.

*Patented

THE IDEAL G-1000
is rated at 1000
input horsepower

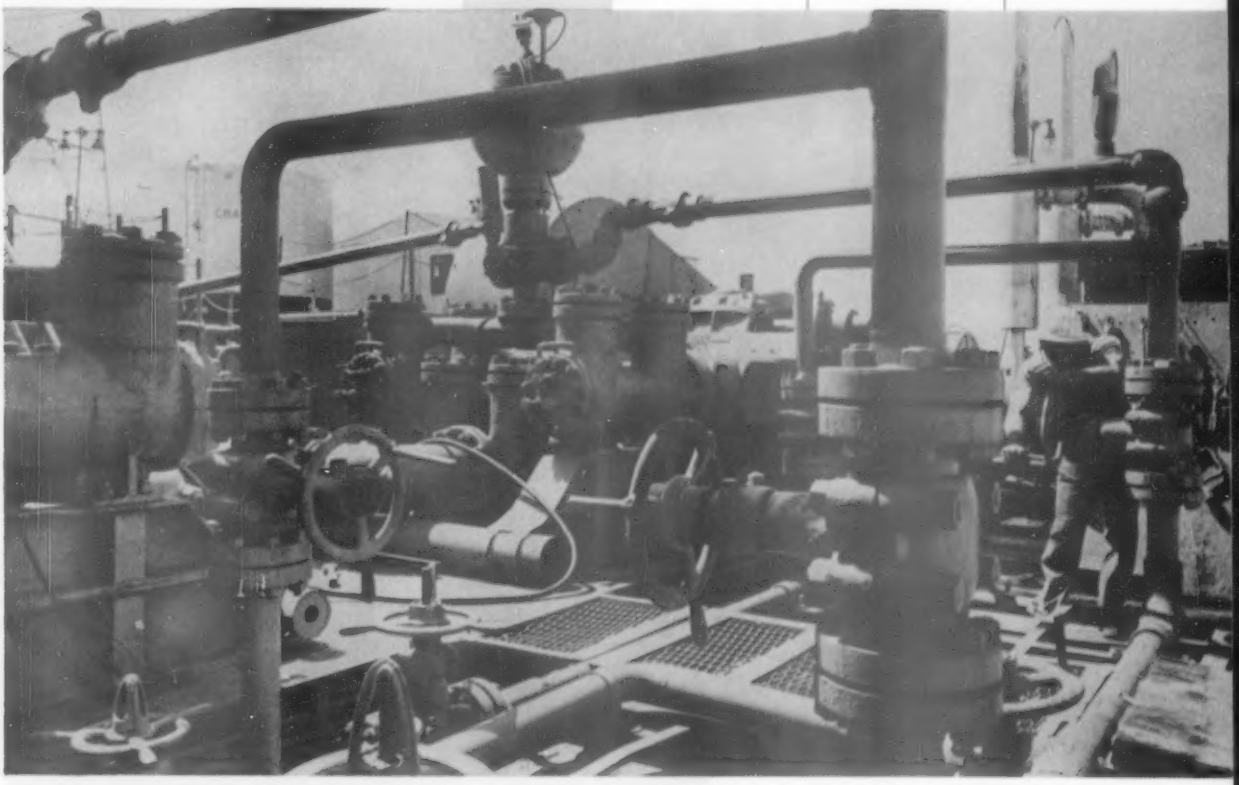
There's a dependable

IDEAL®

SLUSH PUMP

for every drilling need!

TYPE	Rated Max. Input H.P.	Rated Output H.P.	Rated Speed R.P.M.
D-50	80	68	75
C-100	150	128	75
C-150-B	220	187	70
C-250	370	315	65
C-350	600	510	60
G-700	700	595	70
G-1000	1000	850	65



THE
NATIONAL SUPPLY
COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London E. C. 2
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

See the next page for profitable pump drive **FEATURES**

. . . and you get maximum operating flexibility with

IDEAL® INDEPENDENT PUMP DRIVES

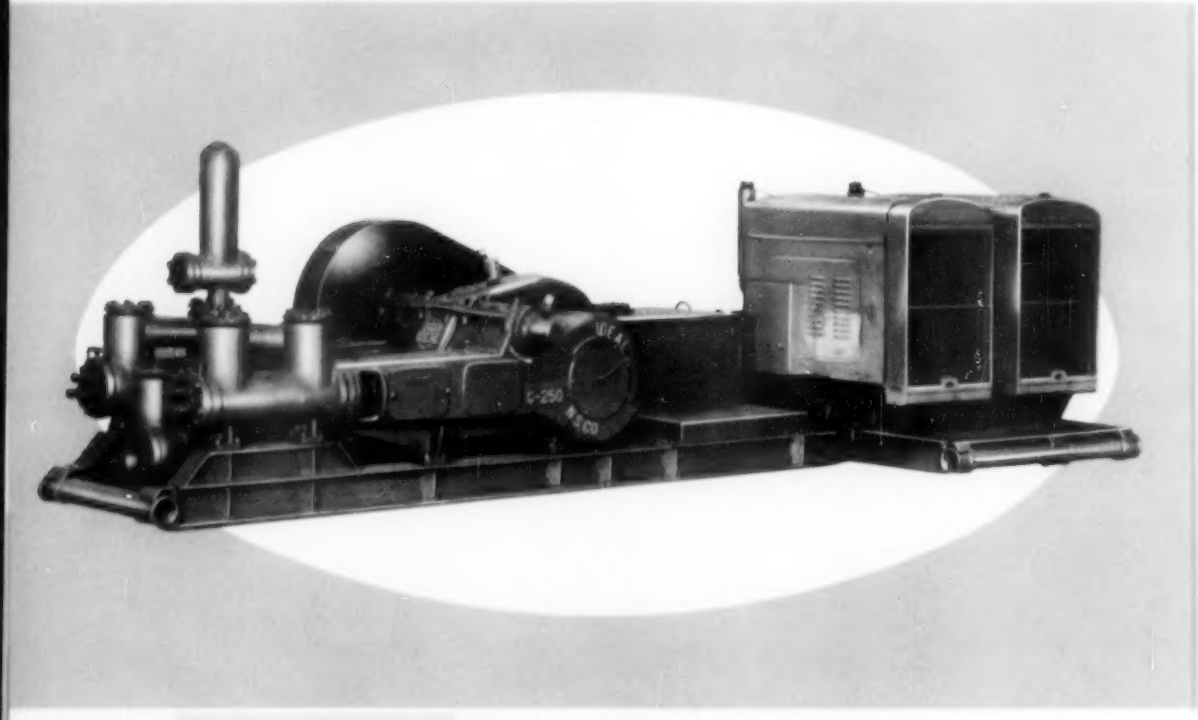
As mud horsepower needs for deeper drilling and jet-bit drilling increase, operators everywhere are modernizing their rigs with Ideal Independent Pump Drives. These pump drives not only provide the flexibility for more effective pump compounding, but also insure greater safety if blow-outs should occur.

Available in both single and multiple-engine types, Ideal Independent Pump Drives provide an exceptionally wide range of flexible power equipment. Every system, too, is ruggedly built, compact and easy to transport.

The outstanding features of the complete and flexible line of Ideal Independent Pump Drives are:

- **Sectionalized construction,** with each section a completely and accurately aligned portable unit
- **Wide power range,** with engine and drive combinations from 150 to 1400 horsepower
- **Three types of transmissions**—a choice of mechanical, Ideal Gyrol, or National Torque Converter
- **Dual-pump and engine** combinations for separate or tandem pump operation with one or two engines

You'll find it worthwhile to get complete details on these dependable pump drives—just ask at the National Supply Store nearest you.



THE NATIONAL SUPPLY COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Pennsylvania • DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance • CANADA: The National Supply Company, Ltd., 200 F.W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta • EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London E.C.2

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE ELECTRICAL CONDUIT

TIW

Hydraseal Packer

DUAL COMPLETION

TESTING

ACIDIZING

HYDRAULIC FRACTURING

THE new TIW Hydraseal Packer requires minimum tubing weight to set packer, as required in permanent completion well techniques.

The outstanding feature of the Hydraseal Packer is the reinforced synthetic rubber cups which permit pressure to be held from either direction, thus reducing tubing weight required. Ample bypass area and a solid mandrel permit circulation through and below the packer.

Automatic bottom, as pioneered by TIW, is featured to set and release packer.

Write for complete details.

TEXAS IRON WORKS

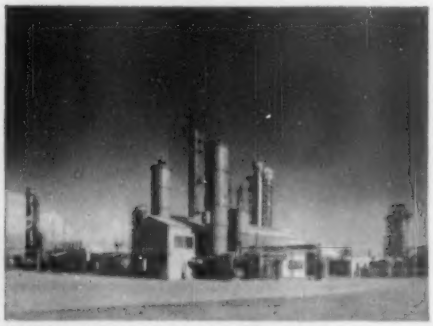
Manufacturers of: TIW Portable Rigs . . . TIW Safety Joints . . . TIW Rotary and Casing Slips . . . TIW Grief Stem Safety Valves . . . TIW Gas Lifts . . . TIW Packers for every purpose . . . TIW Pump Chambers . . . TIW Mudmixers . . . and many other oil field tools.

General Office and Main Plant: P. O. Box 16068, Houston 22, Texas.
Other Shops at Victoria and Corpus Christi.
Export Representative: Val. R. Wittich, 30 Rockefeller Plaza, New York, N. Y.
Oil Field Sales & Service: S.A., Anaco & Maracaibo, Venezuela

A WORLD OF PRACTICAL KNOW-HOW
in the design, engineering, construction and installation of complete refineries, individual processing units and refinery modernization

CANADA – Complete refinery with capacity of 23,000 barrels per day.

ENGLAND – Largest refinery in Britain, with capacity of 125,000 barrels per day.



UNITED STATES – Synthetic ammonia plant, producing 180 tons of liquid ammonia per day.

What Foster Wheeler's

WORLD-WIDE EXPERIENCE

in petroleum processing

means to you

The sun never sets on Foster Wheeler petroleum processing plants. From U.S.A. to the Philippines — from England to South Africa — modern refineries and processing plants designed and installed by Foster Wheeler are producing, every day, high quality petroleum products for free-world consumption.

During the past year, FW has placed in operation complete new refineries in U.S.A., South America, South Africa and the Philippines — plus many additional processing units including the largest crude distillation unit ever built and the highest capacity fluid cat cracker in the world. Work is continuing on similar projects in Brazil, Venezuela, England, France, Spain, Bahrein, Canada and the U.S.A. These world-wide operations are conducted jointly by Foster Wheeler and their subsidiary companies in Canada, England and France.

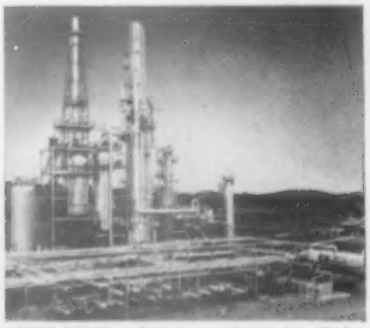
The *experience* which all of this represents is of vital importance to petroleum refiners *everywhere*. It means that virtually every forseeable design and construction problem has already been solved under a variety of conditions. Working with and training unskilled labor in far countries has developed streamlined and simplified construction procedures. And this specialized know-how is constantly being expanded, through research and development, to encompass the latest technological advances in the petroleum and chemical processing fields.

This valuable experience can save you time, effort and expense in any phase of refinery design, construction or modernization. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

FOSTER WHEELER

COLOMBIA, S. A. — Completely modernized refinery with capacity of 30,000 barrels per day.

PHILIPPINES — Complete refinery with capacity of 13,000 barrels per day.



SOUTH AFRICA — Complete refinery installation — capacity, 15,600 barrels per day.

in the manufacture of A. O. Smith Line Pipe . . .

Every fifth man on the production line is a

Quality control

SPECIALIST!

QUALITY CONTROL works full-time in the manufacture of line pipe at A. O. Smith. It's everyone's detail on his own particular job. But in addition, one out of every five employees is a *specialist in quality control.* These inspectors closely and constantly check each operation during production. Their department, independently responsible to management, has full authority to stop any operation for correction when necessary.

QUALITY CONTROL begins outside of A. O. Smith. At the steel mill, A. O. Smith technicians cooperate with mill inspection and control. QUALITY CONTROL continues in A. O. Smith Metallurgical and Testing Laboratories. Finally, from the pickled plate to the shipping platform, it scrutinizes and checks every operation in the manufacture of the A. O. Smith pipe.

QUALITY CONTROL that never leaves the production line is yours at no extra cost when you choose A. O. Smith line pipe. Remember — QUALITY CONTROL is as important to A. O. Smith as it is to the customer. Through it we seek to better serve our customers.

Through research . . . a better way

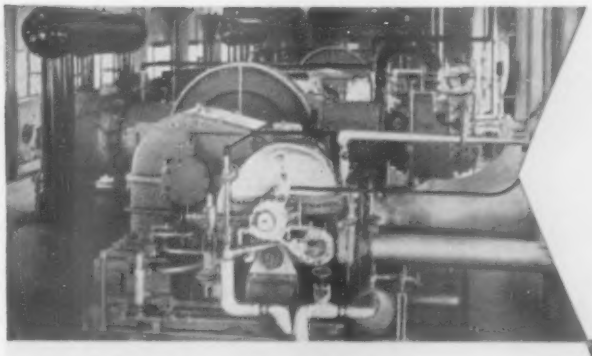
A.O.Smith

CORPORATION

TUBULAR PRODUCTS DIVISION

Chicago 4 • Dallas 2 • Houston 2 • Los Angeles 22 • Midland 5
Texas • New Orleans 12 • New York 17 • Pittsburgh 19
San Francisco 4 • Seattle 1 • Tulsa 3 • Washington 6, D. C.
International Division: Milwaukee 1, Wis.

Need a long-life gear unit for refinery service?



SPEED REDUCERS

Farrel speed reducers are adaptable in critical detail. This results in the solution of innumerable application problems. Designs include single, double and multiple reduction units, speed change units, and drives to meet special requirements.

Shown at the left, are two double reduction gear units, each transmitting 920 HP at 4000 RPM to a compressor operating at 300 RPM.

SPEED INCREASERS

Farrel type SI gear units are specially designed for the high peripheral speeds encountered in speed increasing applications. Speed ratio range from 1:1 to 12:1 with one pair of gears. Special units having two sets of gears are made with ratio range from 12:1 to 40:1.

In the illustration at the right, a type SI unit is transmitting 375 HP and stepping up the speed from vertical gas engine to hot oil pump in refinery.

RIGHT ANGLE DRIVES

Type RA vertical drives are used extensively for either increasing or reducing speed from internal combustion engines or high-speed turbines to vertical pumps. Hollow vertical shaft, which permits easy adjustment of the pump shaft without disturbing gears or bearings, can be supplied.

At the left, two RA-20 vertical right angle units are transmitting 250 HP from steam turbines at 4000 RPM to deep-well water pumps at 1746 RPM.

When you choose Farrel, you get the gear unit that's right for the job. What's more, you're assured of *sustained* operating efficiency throughout a long service life, thanks to sound engineering, accuracy of manufacture, and use of highest grade materials.

The gears have precision generated teeth; shafts and bearings are factored to safeguard against interruption of vital processes; gear cases proportioned to withstand repeated heavy peak loads; joints sealed against dirt.

Detailed bulletins, on any of the gear units mentioned, available on request.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

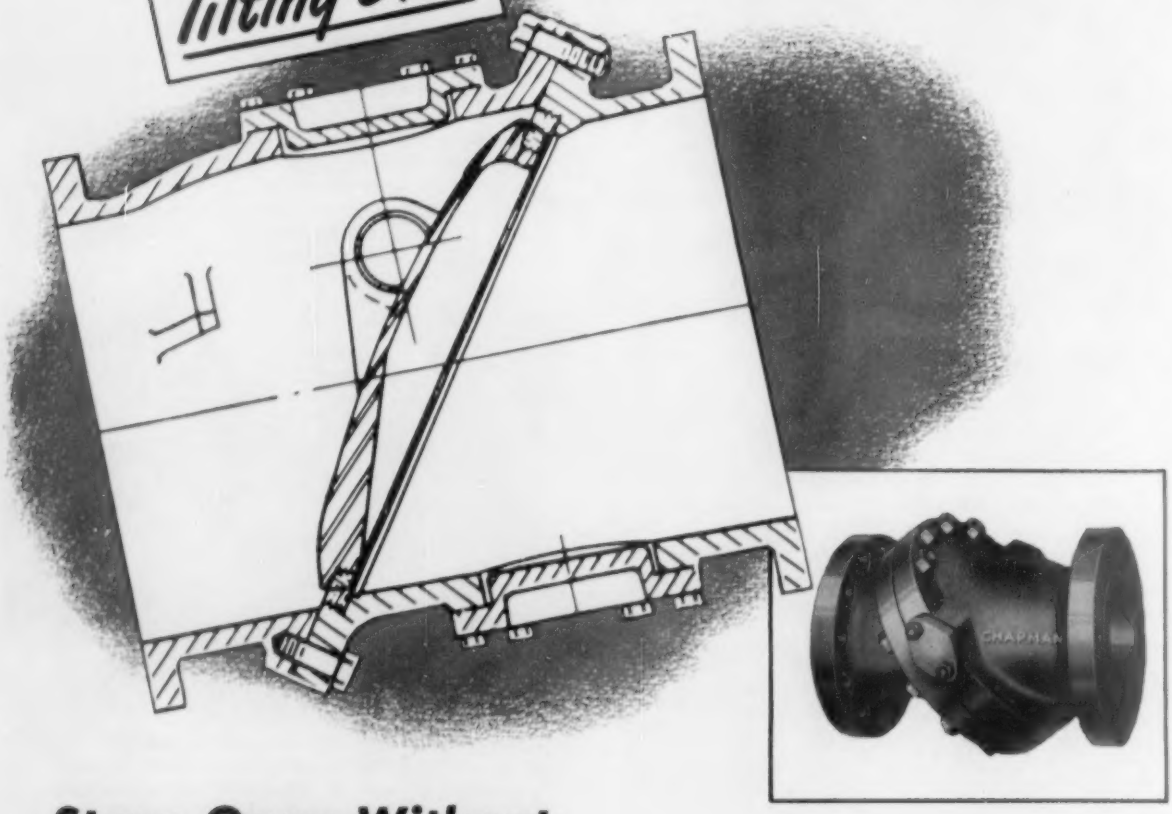
Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Akron, Detroit, Chicago, Memphis, Minneapolis, Fayetteville (N. C.), Los Angeles, Salt Lake City, New Orleans

OIL FIELD REPRESENTATIVES:
Hercules-Lupfer Engine Sales Co., 124 N. Boston St., Tulsa 1, Okla.
V. W. Osborne, 860-A M&M Building, Houston 2, Texas
FB-996

Farrel-Birmingham®

CHAPMAN'S

Tilting Disc CHECK VALVE



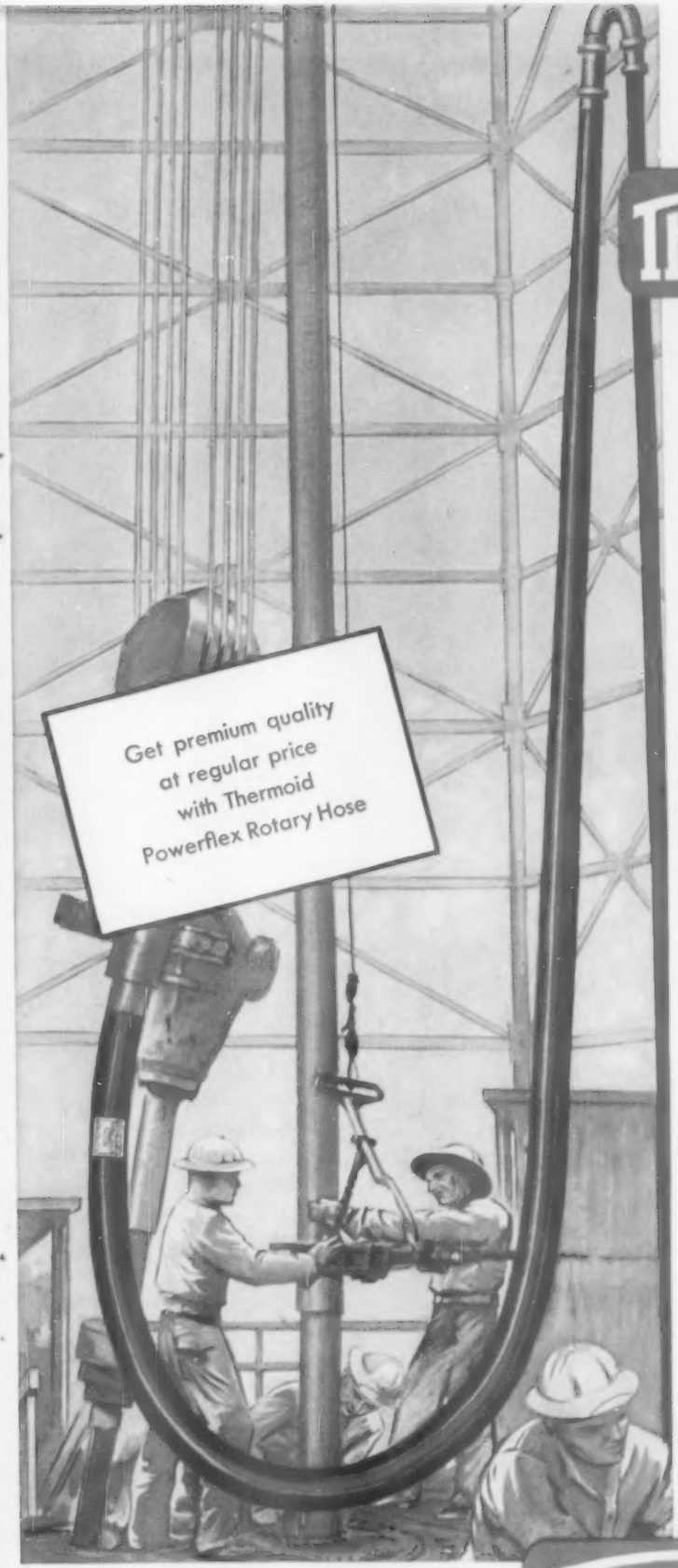
Stays Open Without Flutter, Closes Fast Without Slamming

Chapman's Tilting Disc check valve keeps maintenance costs down in the entire piping system. There's no flutter or vibration in the open position: the lightweight, airfoil-designed disc is held firmly against its stops by the fluid flow.

When flow starts to reverse, the uniquely designed disc swings quickly to the closed position, cushioned by fluid pressures, and then drops to a tight seal against the seat, without sliding or scraping. Closure is fast, tight . . . and *quiet*. Slamming is *eliminated*, in all but unusual piping arrangements.

Freedom from vibration and slamming, low wear and low head loss keep maintenance costs down, give years of more efficient service. For every check valve service, specify Chapman's Tilting Disc. Available in steel or iron, with suitable trim to meet service conditions. Full engineering data are in Catalog 30. Write for it today.

The Chapman Valve Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS



Thermoid

POWERFLEX Rotary Hose

. . . the most widely imitated Hose in the oil field!

None have been able to fully match the strength and flexibility of Thermoid Powerflex Rotary Hose.

Powerflex is made of oil-and-abrasion-resistant synthetic rubber, reinforced with impregnated multi-ply woven fabric and high tensile steel cable. Its tough, extra-heavy cover resists weather and abrasion. The materials used in Powerflex are available to any hose manufacturer. But it's the way Thermoid wraps and couples Powerflex Hose that prevents duplication.

Patented full-flow couplings are an integral part of each cable, permanently secured before the hose is wrapped. They are guaranteed and leak-proof . . . positively cannot blow off. Every length is pre-tested to 5,000 psi . . . exceeds all API requirements.

For heavy duty service, always demand Thermoid Powerflex Rotary Hose . . . available in all standard sizes and lengths. Order Powerflex and other Thermoid Oil Field Products listed below, from your nearest supply store or from one of the Thermoid warehouses listed in:

Houston, Texas
Oklahoma City, Okla.
Nephi, Utah
Casper, Wyoming
Los Angeles, Cal.

Thermoid

Powerflex Rotary Hose • Trioflex Slim-Hole Rotary Hose • Mud-Flo Slush Pump Hose • Flexible Discharge Units • F.H.P. and Multiple V-Belts • Oil Country Flat Belting

Wire Line Turn Backs • No-Wip Line Savers • Stuffing Box Rings • All Types of Hose • Molded Specialties • Brake Blocks

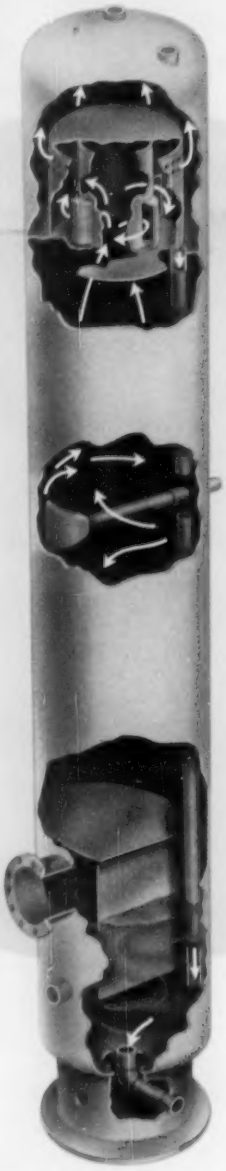
Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

Why is Dunham Tanks forging ahead?

(NO. 6 IN A SERIES OF 10 ADS.)

New, Advanced Vertical LP Oil & Gas Separator:

better because..



Larger oil and gas capacity!

The new **Dunham inlet diverter!** Diverts the well stream into a thin film swirling around the inside wall causing maximum-efficient primary extraction.

The **cyclonic mist extractor** completes the separation of mist from gas. The design utilizes centrifugal force, impingement, change of direction, contact scrubbing and change of velocity to give mist-free gas.

Look to Dunham for continued leadership in modern engineering advancements in all phases of oil field production equipment!

Products:

Welded and Bolted Steel Tanks, Steel Stairways and Walkways, Vertical and Horizontal Oil & Gas Separators, Emulsion Heaters and Treaters, Indirect Gas Heaters, Cold Separation Units, Two Stage Separation Units, Gas Dehydration Units, Three Phase Separators, Free Water Knockout, Servel Refrigeration Units and LeRoi Compression Units.

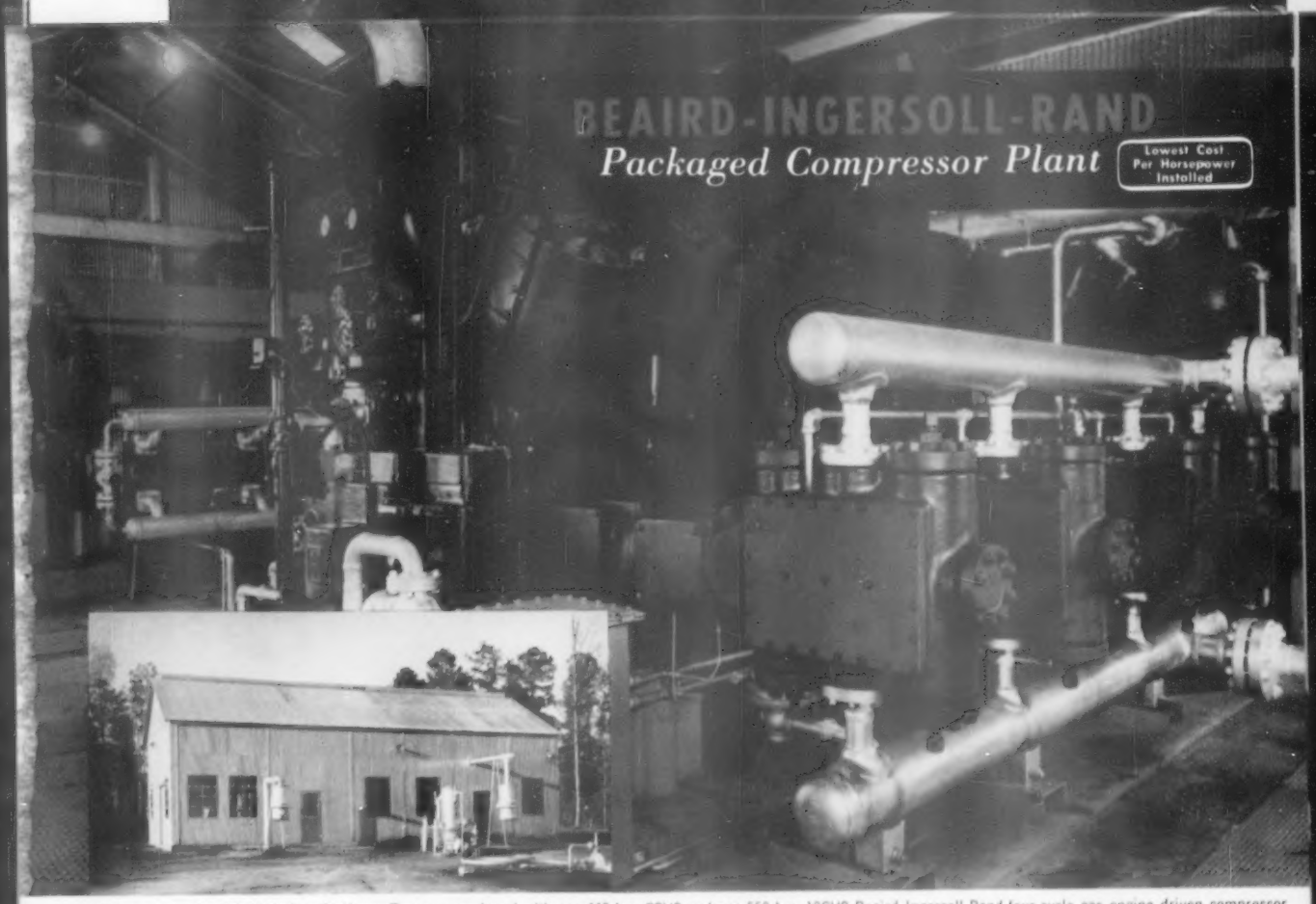
ANDERSON-DUNHAM, INC. DUNHAM TANKS TANK DIVISION

DUNHAM TANKS

Division of Anderson-Dunham, Inc., Baton Rouge, La.

Plant: Minden, La. Sales and Service: Shreveport, La.; New Orleans, La.; Lafayette, La.; Perry, Okla.; Seminole, Okla.; Tulsa, Okla.; Ardmore, Okla.; Odessa, Tex.; Corpus Christi, Tex. (Lester Moore Tank & Supply Co.); Houston, Tex.; and, Natchez, Miss.

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah



R. Lacy, Inc., Frost Hull Station, Carthage, Texas — equipped with one 440 h.p. 8SVG and one 550 h.p. 10SVG Beaird-Ingersoll-Rand four cycle gas engine driven compressor plants with Young radiators and all necessary controls. Other sizes 110 to 660 h.p.

R. LACY, INC., has planned its Frost Hull station to utilize to the fullest the flexibility of operation possible with packaged compressors. Boosting gas from nearby Carthage, Texas, fields into a sales line, the station was initially equipped with a single 8SVG 440 h.p. Beaird-Ingersoll-Rand packaged compressor plant. The original piping of the installation included connections for the addition of a second packaged unit should wellhead pressures continue to drop off. A year later a 10SVG 550 h.p. Beaird-Ingersoll-Rand packaged compressor was added.

Now operating with single-stage compression, the units pick up gas at 475 psig and boost it to 1,175 psig for delivery to the line. Should wellhead pressures continue to decline, a third unit could be added to the station or the existing units changed over to two stages of compression. Later one of the units could be transferred to other service leaving the remaining plant to complete production. Requiring a minimum in the way of foundation and connecting piping, the entire compressor installation will be almost wholly salvageable when moved.

Let us show you how a Beaird-Ingersoll-Rand packaged compressor plant can be designed to meet your requirements.

Handle Pressure Drop Off—

FLEXIBLE INSTALLATION MADE WITH PACKAGED COMPRESSORS

THE J. B. BEAIRD COMPANY, INC.

Shreveport, Louisiana

BEAIRD

MACHINING • MANUFACTURING • STEEL WAREHOUSE

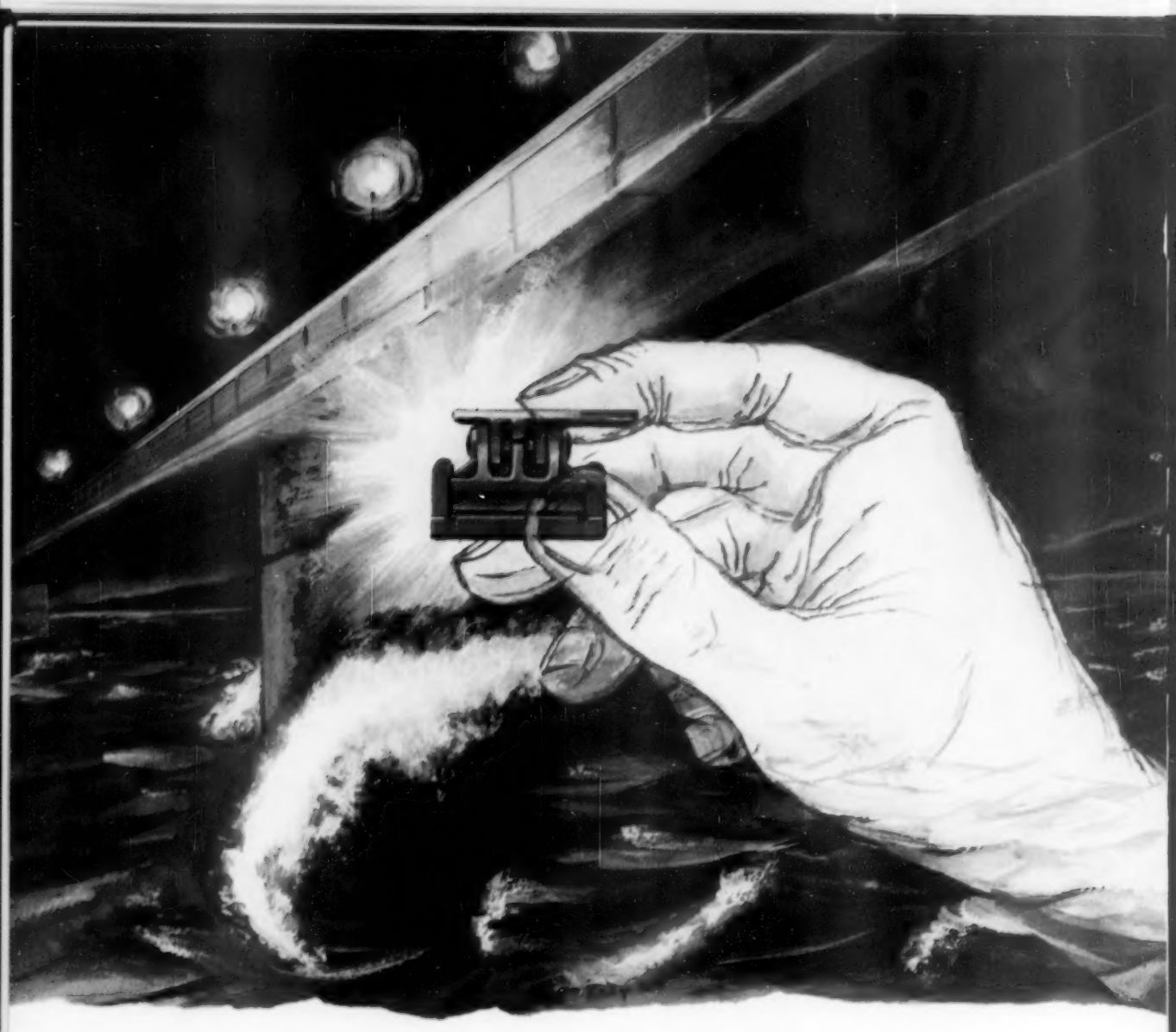
PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS



SHOES for a bridge that walks

LITERALLY PACING BACK AND FORTH on its foundation as it reacts to heat and cold, this giant bridge across the Red River was fitted with massive shoes of steel — made by Beaird's machining division. Well known in the oil and gas industries for packaged compressor plants, pressure storage vessels and cast steel fittings, Beaird has an equally wide-spread reputation as a dependable source for contract machined and fabricated parts and sub-assemblies.

The walking bridge is only one of the many engineering achievements that Beaird's versatile machining division is helping to build. One of five manufacturing divisions at Beaird, the machining division brings to its customers the integrated resources, facilities, experience and skills of all five Beaird manufacturing divisions.

Let us show you how Beaird can offer you dependable production on your product . . . at lower cost . . . by writing The J. B. Beaird Company, Inc., Shreveport, Louisiana.

PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

PRESSURE GAS STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

BEAIRD

MACHINING
STEEL WAREHOUSE
FABRICATING

BLACK MAGIC

holds the three most outstanding depth records in the world

1—The deepest well in the world.

2—The deepest well in the Gulf Coast (and third deepest well in the world).

3—The deepest producing well in the world.

Field	Total Depth (ft)	Date Well Reached T.D.	Black Magic Used From	Amount of Open Hole at Time of Total Depth (ft)	Bottom Hole Temp.	Total Time Black Magic in Use	Weight of Black Magic at Total Depth
PALOMA, CALIFORNIA	21,482	Oct. 29, 1953	10,955' to T.D.	10,535	353°F (est.)	over three yrs.	15.4 #/gal. (115 #/cu.ft.)
WIGGINS, MISSISSIPPI	20,450	May 30, 1951	14,670' to T.D.	6,412	389°F (actual)	over five yrs. (still in use)	11.4 #/gal. (85.5 #/cu.ft.)
COLES LEVEE, CALIFORNIA	17,895	Nov. 11, 1953	8,704' to T.D.	11,384	376°F (est.)	312 days	15.4 #/gal. (115 #/cu.ft.)

Here are five very good reasons why Black Magic oil base drilling fluid is used for drilling deep wells:

1 *Not susceptible to high temperature solidification.* Black Magic remains more stable under high temperature and pressure than any other drilling fluid. This fact has been proven repeatedly in the field and in the laboratory.

2 *Zero filtrate loss.* Black Magic deposits a thin, oily mud cake; prevents washouts and swelling of shales; drills a hole to gauge and minimizes danger of pipe sticking.

3 *Low viscosities.* In a recent deep test the viscosity of Black Magic was only 65 seconds API, although highly weighted to 18.4 lbs/gal. (138 lbs/cu.ft.). Fluidity and pumpability were excellent. In the deepest well ever drilled, only 800 psi was necessary to break circulation at 20,000', and while drilling at this depth pump pressures were not needed beyond 1,700 psi. Accurate logs were obtained.

4 *Low maintenance costs.* This is the most important point of all. Black Magic requires very little supervision. In the deepest well in the Gulf Coast, the total cost of maintaining Black Magic (including transportation) averaged less than $50. a day! Black Magic changed the mud program from the most costly to the most economical phase in the entire drilling operation of this well.

5 *Never wears out.* Black Magic can be stored indefinitely without deteriorating. It can be regenerated and moved from well to well and used over and over again.

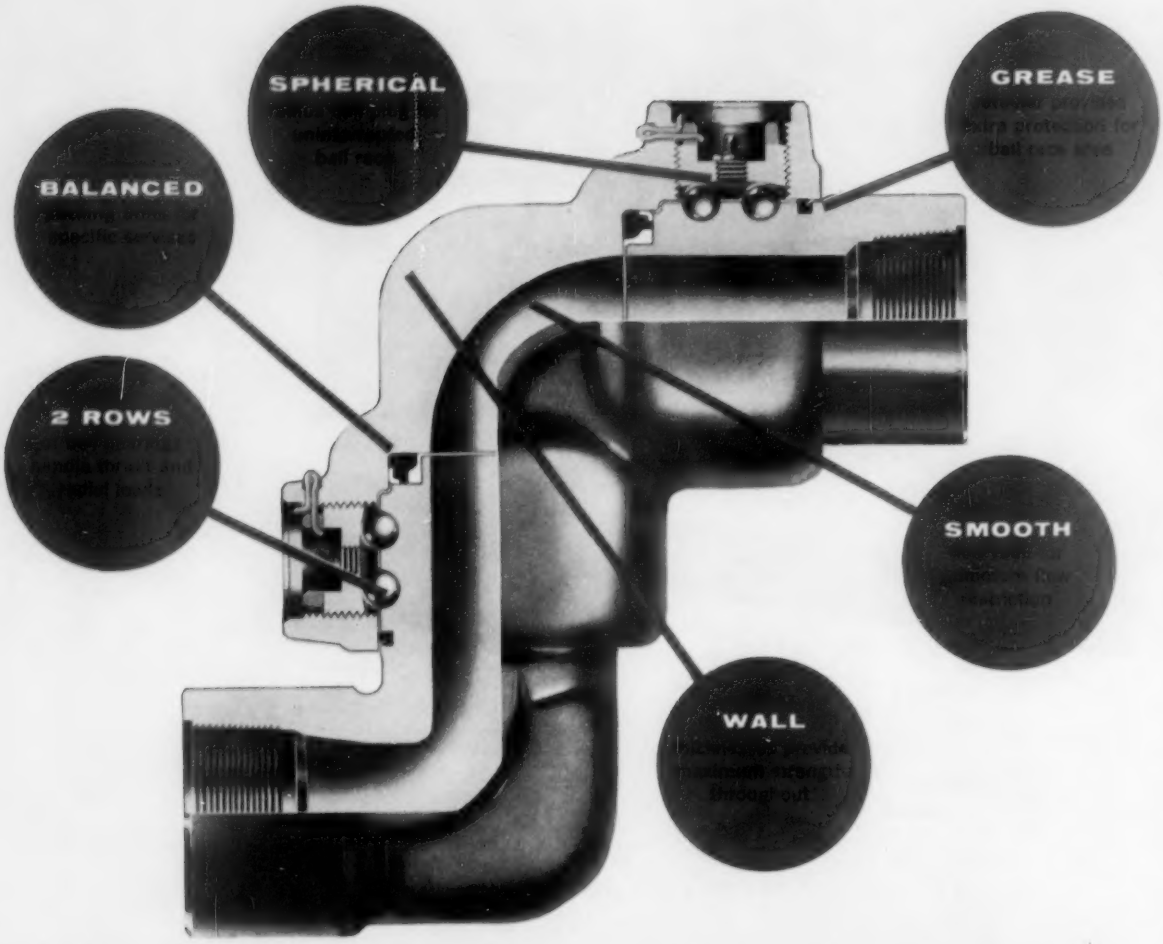
These are only the primary reasons why Black Magic should be specified whenever drilling goes deep. Consult your nearest OBI representative for complete details and other actual case histories.

OIL BASE, INC.

130 ORIS STREET, COMPTON, CALIFORNIA
Plants in Compton, Houston, Odessa, Duncan

BRANCHES: Bakersfield • Long Beach • Ventura Houston • Odessa • Oklahoma City • Duncan Jennings • Harvey • Calgary • Caracas • Lima Mexico, D. F. • Paris, France • Cable Address: OBI

OB PRODUCTS



precision engineered for your service

CHIKSAN Ball-Bearing Swivel Joints are precision engineered like a fine watch to give unlimited flexibility and unlimited service in the conduct of fluids, gases and liquids.

CHIKSAN is the originator and largest exclusive manufacturer of ball-bearing swivel joints in the world today.

CHIKSAN produces packing designs for specific service requirements, assuring constant torque at any given pressure.

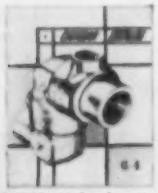
CHIKSAN has acquired a world-wide recognition for highest quality of product and lowest maintenance costs.

CHIKSAN has over a quarter of a century of "know-how" in the design, manufacture and successful scientific application of ball-bearing swivel joints in industry.

CHIKSAN offers the widest range of styles, sizes and pressures available for every major industrial use today.

CHIKSAN has complete nation-wide coverage of its products and applications by qualified field service engineers.

CHIKSAN will custom engineer for you the solution to any problems involving the transport of fluids, gases and liquids.



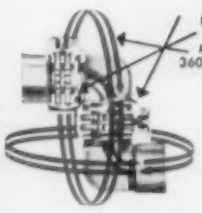
Write CHIKSAN for latest INDUSTRIAL CATALOG—G-4 Dept. OGJ-6

Supply and Service of CHIKSAN Ball-Bearing Swivel Joints is always as near as your telephone.

The Flow of Enterprise Relies on

CHIKSAN

Ball-Bearing Swivel Joints



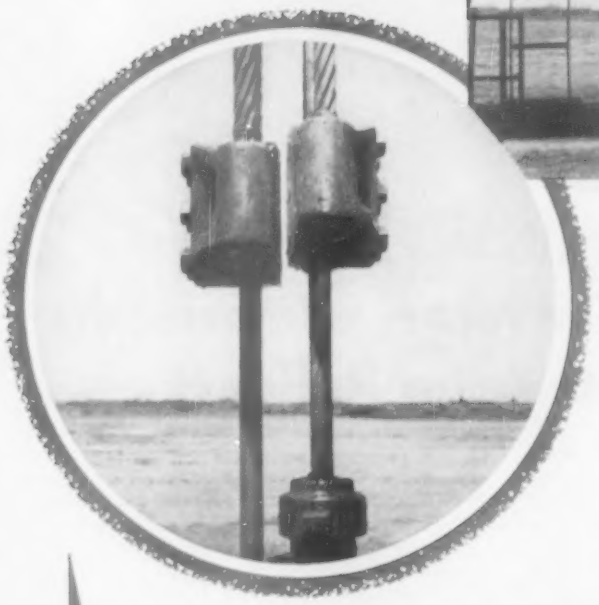
CHIKSAN Ball Bearing Swivel Joints are THE NEW TOOL of Modern Industry with full 360° rotation in 1, 2, and 3 planes. Over 1,000 different types, styles, and sizes have been developed for pressures and services from 28" vacuum to 15,000 psi and for temperature ranges from minus 70° to a plus 500° F. with packing materials for each specific service.

CHIKSAN COMPANY • BREA, CALIFORNIA • Chicago 3, Illinois • Newark 2, New Jersey

Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Co., Brea, Calif.; Newark 2, N. J. • Chiksan of Canada Ltd., Edmonton, Alta.

two LUFKINS get their HEADS together

to solve another "Knotty" dual completion pumping problem



New LUFKIN "Flush Type" hanger bar with built-in polished rod clamp makes possible the operation of two strings on as close as 3¾ inch centers.

◀ TWO ZONES PRODUCED INDEPENDENTLY IN ONE WELL BY THE USE OF TWO PUMPS WITH SEPARATE STRINGS OF TUBING AND RODS.

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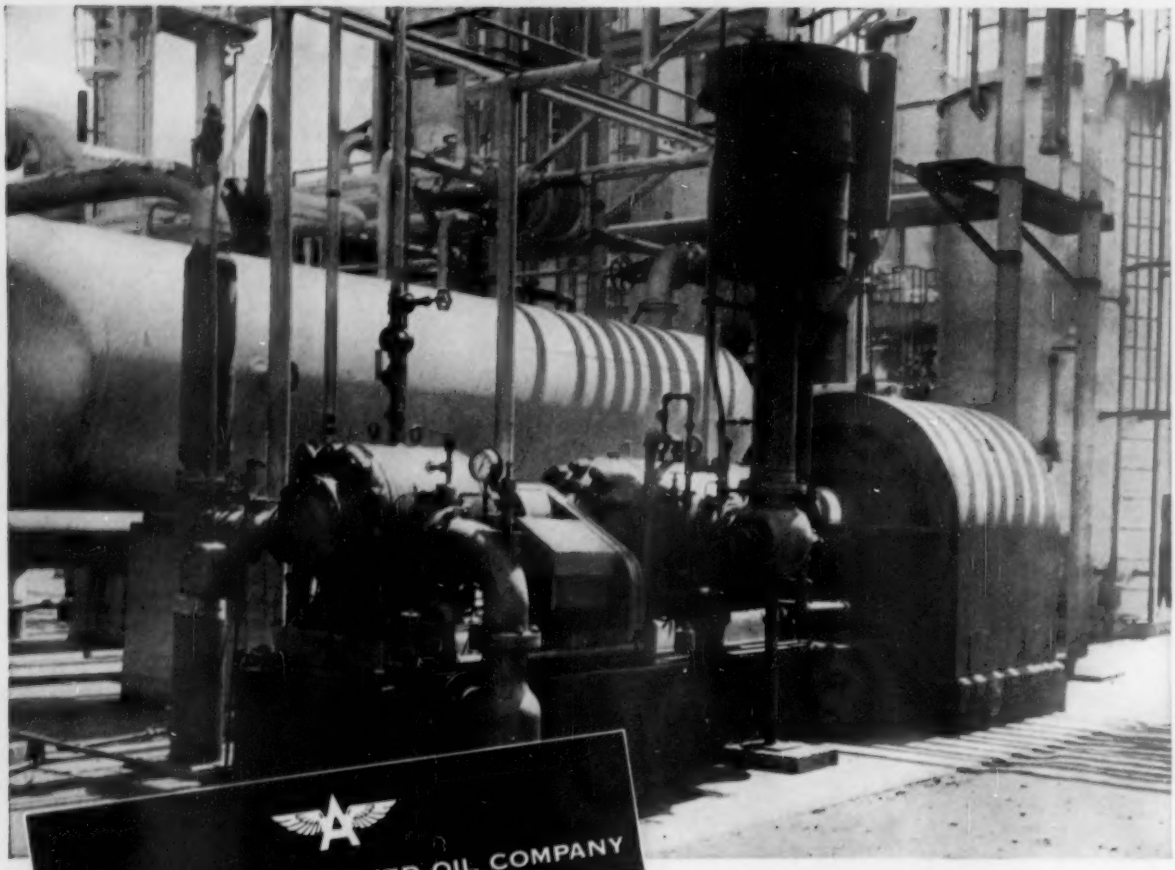

installs fuller rotary compressors in its Avon Refinery

When Tide Water Associated needed additional air for various operations in its Avon plant, its engineers investigated the possibilities of the Fuller Rotary Compressor. After making a thorough study of its merits, Tide Water purchased and installed two C-300-300H two-stage units, each supplying 1598 c.f.m., 100-lb. air for general plant use, one of which is shown above. Note that this machine is installed out in the open with no protection from varying weather conditions, operating 24 hours per day, seven days a week.

These two-stage machines are located in different departments of the plant to best meet the air-load requirements of the particular department being served.

Tide Water also has installed in this same plant, two C-300 Fuller Rotary single-stage compressors with a capacity of 1542 c.f.m. each, at 40-lb. pressure, used in the catalyst-cracking process.

Hundreds of Fuller Rotaries are serving the petroleum industry, proving their worth for general plant air, purging gas, refrigeration in alkalization units, and handling butane-butylene in the refinery, as well as in the field for pressure boosting and gas gathering.

Simplicity of construction has proved to be one of the important factors—no valves to leak, no seats to grind, results in maintained capacity for the life of the machine; simplified drive eliminates power transmission losses. For full information write us for Bulletin C-5A.

Fuller
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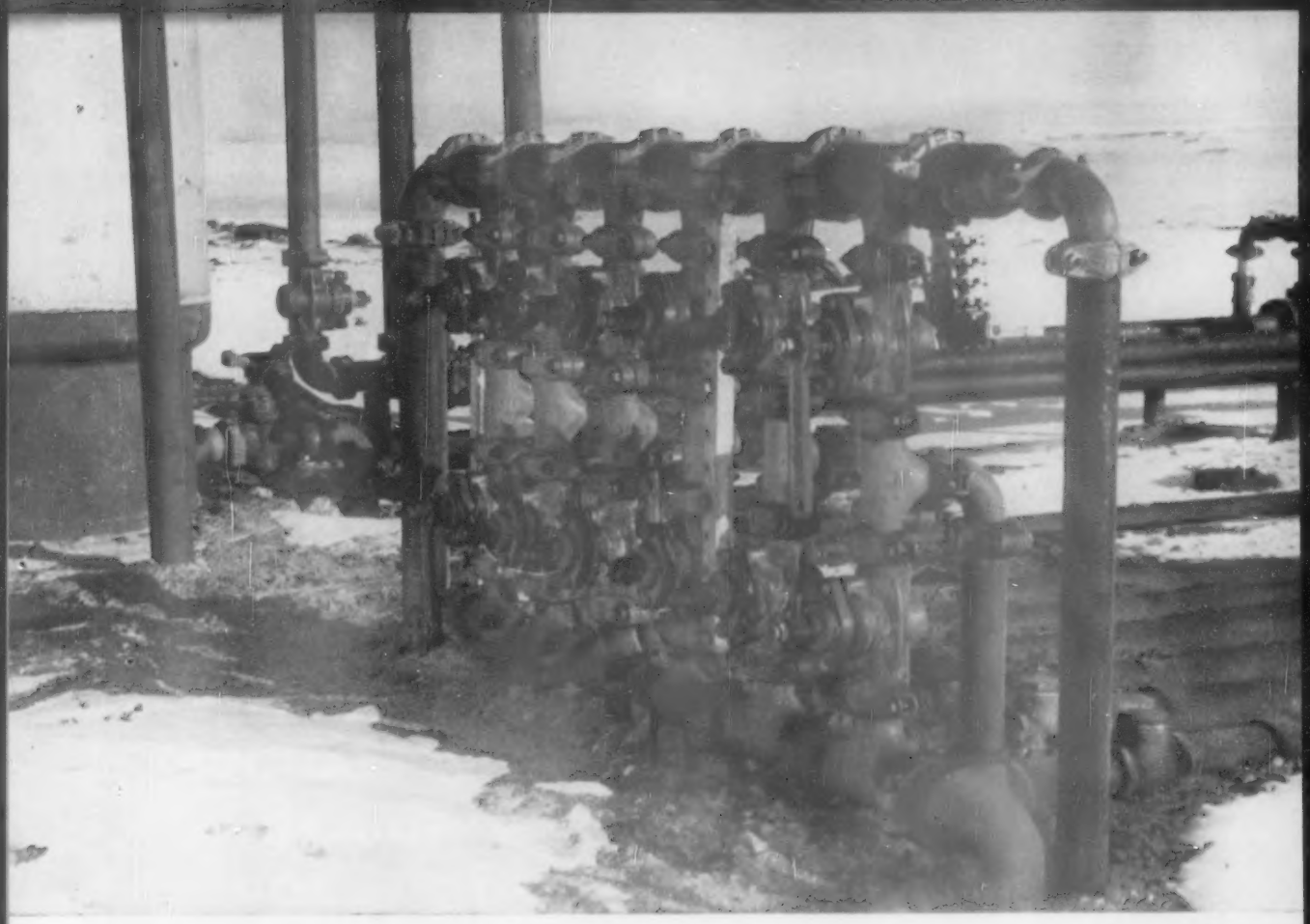


Rockwell-Nordstrom Valves With Grooved End Couplings...

Fast, Easy, Compact Installations ...Anywhere

Rockwell-Nordstrom valves with grooved end couplings assure fast, easy, tight installations on any petroleum operation from the field to marketing. With grooved end coupling, valves and lines may be dismantled as often as necessary without damage to the pipe or the couplings. These valve couplings compensate completely for expansion and contraction, and they do away with the need for level ditching since several degrees of deflection are possible at each joint.

But whether the Rockwell-Nordstrom valves you use have grooved, flanged, welded, or screwed ends, the valve itself assures leakproof, trouble-free operation at lowest cost per year because it is pressure lubricated. Pressurized lubricant sealing eliminates the inefficiency of metal-to-metal sealing, and lubrication eliminates metal-to-metal friction which is the major source of costly valve wear. On any service, quarter-turn operation makes dependable flow control smooth and easy.

Rockwell-Nordstrom valves are *the original* lubricated plug valves. No matter what your needs, there is a Rockwell-Nordstrom valve that will do the job better and at lower cost than any other valve you've ever used. Write today for more information: Rockwell Manufacturing Company, Pittsburgh 8, Pa.

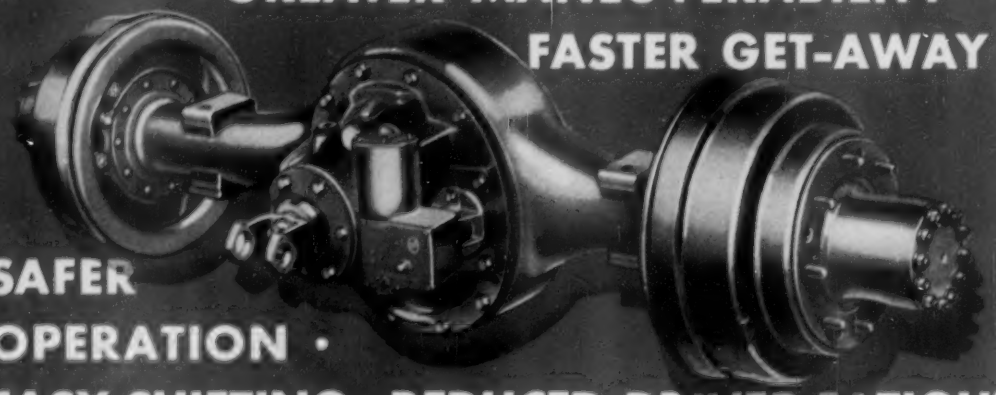
* * *

Canadian Valve Licensee: Peacock Brothers Limited.

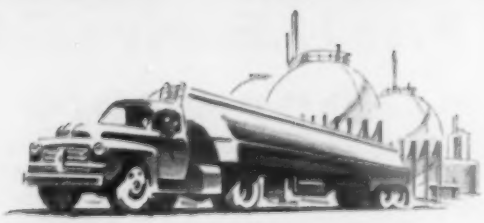
ROCKWELL-Nordstrom VALVES

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

A GEAR RATIO FOR EVERY SITUATION · POWER WHEN NEEDED · SPEED WHEN WANTED · QUICKER FULL-LOAD TRIPS · GREATER MANEUVERABILITY · FASTER GET-AWAY · SAFER OPERATION · EASY SHIFTING · REDUCED DRIVER FATIGUE · LOWER OPERATING COST · REDUCED ENGINE WEAR · LESS SHOP TIME · LOW MAINTENANCE COST · LONGER TRUCK LIFE · HIGHER TRADE-IN VALUE



ALL *with* Eaton 2-Speed Axles



More than Two Million Eaton Axles in Trucks Today!

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AXLE DIVISION

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It is a wise policy to have your chlorine equipment and facilities examined every year by a Columbia-Southern engineer.

Our Technical Staff will review this phase of your operation for efficiency and safety. They will consult with any of your employees on the proper methods of handling and unloading chlorine and review safety practices and first aid measures.

This is one of the many services Columbia-Southern renders to Chlorine users. Contact any of our offices today.

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IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

"..here's MY warehouse at Great Bend, Kansas!"

This new store at Great Bend has been in operation several months. Other J&L operations in Kansas include stores at Chase, El Dorado, Hill City, McPherson, Russell, and Winfield, with resident salesmen at Bushton and Wichita. District Manager J. A. Carrigan (see picture below) maintains general offices in Wichita.

PAUL CHISHOLM
Local Store Manager

VIRGIL SHANK
Storeman

R. R. VAN DINE
Storeman

J. D. KECK
Storeman

C. A. SMITH, JR.
Pump Service Man

W. P. KNOWLES
Salesman

E. J. PIERSON
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J. A. CARRIGAN
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SUPPLY DIVISION – TULSA, OKLAHOMA
Serving The United States and Canada

PESA
PARTNERS IN PETROLEUM PROGRESS

126-1

Sargent PUMPS

engineered to lift more oil per day at lower costs per barrel

Recognized leader in the development of bottom-hole production pump design, Sargent leads the field in pump engineering, combined with research and manufacturing skill to build pumps that put more oil in your tanks every day, month after month, with minimum maintenance and at lower cost per barrel.

SERVICE Sargent recognizes the importance of pump maintenance and provides the most complete service facilities in the industry. This service is always available through Sargent sales and service stores conveniently located throughout the oil country and staffed by company-trained pump experts.

On the basis of performance and service, Sargent pumps give you more for your money.

Write for complete details.

Sargent, who originated the Insert Rod Sectional Liner Pump, once again offers the latest and best method of pumping oil, through its development of the Sargent Rodless Hydraulic Pump. This pump puts the long stroke unit at the bottom of the well, where it belongs, to operate hydraulically the time-proven standard bottom-hole pump. Rod problems and tubing wear are eliminated. The ultimate in gas compression ratio (elimination of gas lock) is thus obtained with this unit because pump valves are accurately spaced before the pump is run into the well.

Standard Sargent API pump parts facilitate service maintenance of the rodless pump, which can be repaired in any of the Sargent sales and service stores.

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2533 East 56th Street
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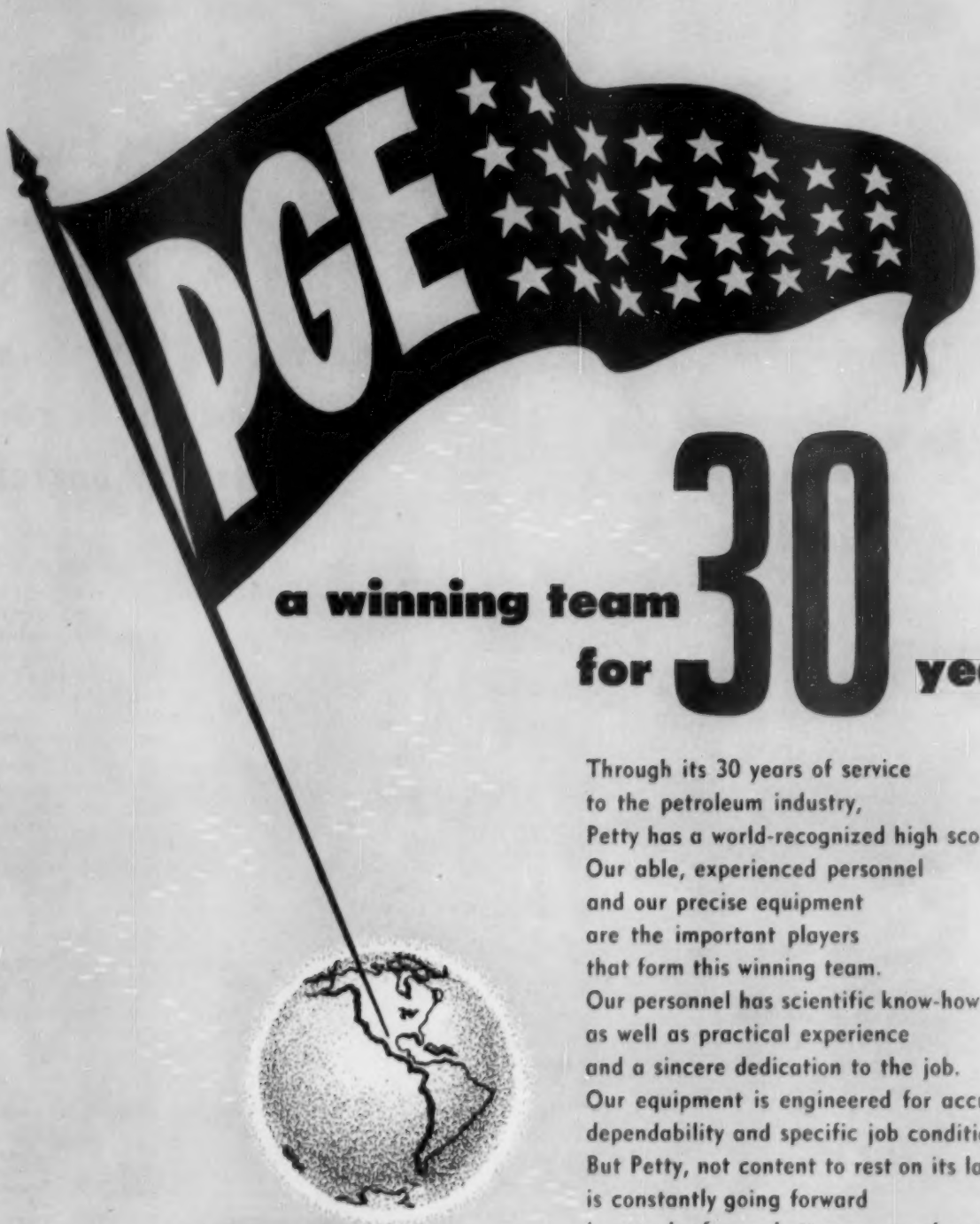
"GOOD WILL" is the disposition of the pleased customer to return to the place where he has been well treated.
U. S. Supreme Court

BUILDS PUMPS THAT BUILD GOOD WILL



a winning team for 30 years

Through its 30 years of service
to the petroleum industry,
Petty has a world-recognized high score.
Our able, experienced personnel
and our precise equipment
are the important players
that form this winning team.
Our personnel has scientific know-how
as well as practical experience
and a sincere dedication to the job.
Our equipment is engineered for accuracy,
dependability and specific job conditions.
But Petty, not content to rest on its laurels,
is constantly going forward
in search of even better ways and means
to obtain more accurate data.

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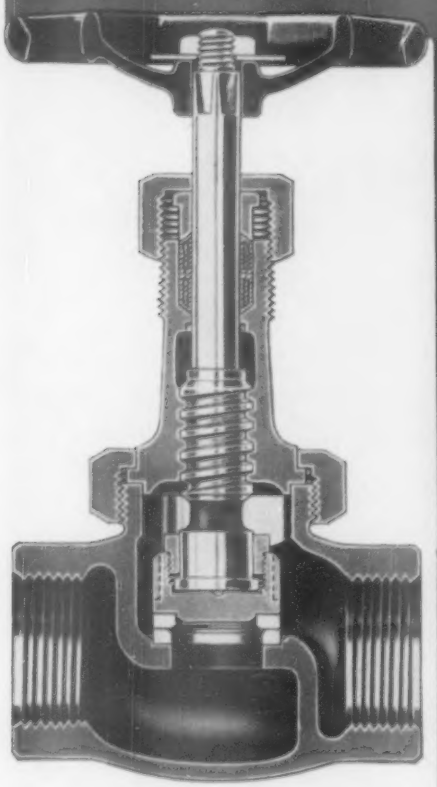
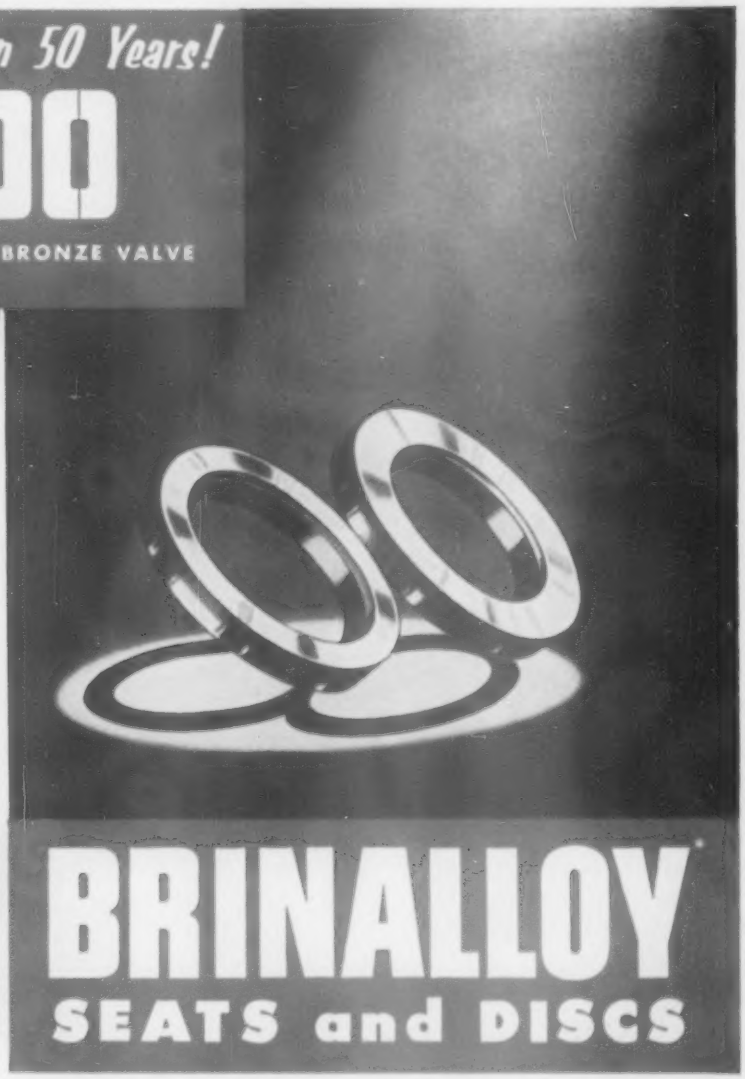
Biggest Valve News in 50 Years!

LQ600

THE REVOLUTIONARY NEW BRONZE VALVE





BRINALLOY

SEATS and DISCS

HERE'S THE BIGGEST BRONZE VALVE NEWS IN HALF A CENTURY—made possible by Brinalloy, a new patented seating alloy developed in the Lunkenheimer Metallurgical Research Laboratories. Seats and discs of this new alloy are far more resistant to wear and corrosion than 500 Brinell Stainless Steel — they even outwear case-hardened Stainless Steel exceeding 1000 Brinell! In the most severe tests, there was no need for renewability, repair, or replacement.

LUNKENHEIMER QUALITY

NOW you can beat the high cost of valve maintenance and replacement with the first completely revolutionary bronze valve in 50 years! No matter how severe the throttling service, in 4-year tests, there was no leakage, erosion, or wire drawing. This new valve pays cash dividends in maintenance savings — *year after year after year!* For more information, call your Lunkenheimer Distributor or write The Lunkenheimer Company, Box 360, Cincinnati 14, Ohio.

** Patented Alloy*

BRONZE • IRON • STEEL • PVC

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

L-555-9

"Sticky going"

This section of the 645-mile, 30" Lakehead extension of the Interprovincial Line is literally being "stuck in the mud" as it travels westward through Michigan swampland. It was laid in unbelievably tough terrain as shown above, where welders had to stand on platforms to keep from sinking knee-deep in mud. But "sticky going" is all in a day's work for pipeline builders... and for Barrett Protective Coatings, too.

This line was coated with Barrett Primer and Coal-tar Enamel for its entire length to afford it the finest protection available for steel pipe. When you specify Barrett you get not only the best coatings obtainable but the best "know-how" available. The Barrett Technical Service Group provides you with expert assistance right from the planning stage. It will help you select the wrapping and coating that provide top protection at minimum cost ... protective coating that will increase the cost of a steel pipeline by only the smallest fraction while prolonging its life indefinitely.

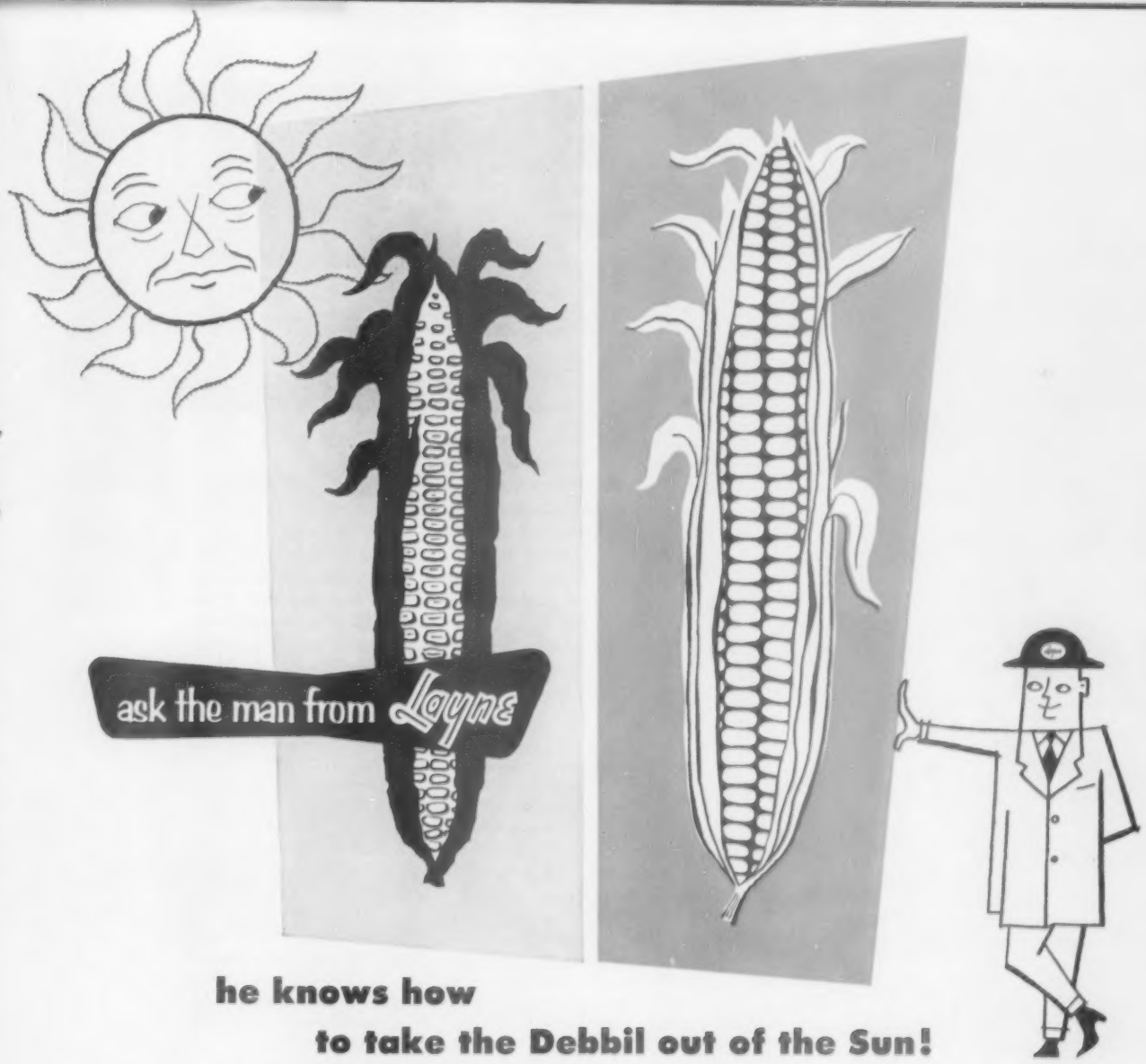
We welcome the opportunity to place the Barrett Technical Service Group at *your* service. For detailed information — phone, write or wire Barrett.

BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N. Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, Que.

Barrett®

BARRETT PROTECTIVE COATINGS

OVER 100 YEARS OF EXPERIENCE



he knows how to take the Debbil out of the Sun!

Old Sol—Devil or Saint can be . . . but to the farmer or rancher who has proper irrigation, the Sun is all Saint.

Layne knows a great deal about irrigation in all its phases because Layne knows a great deal about water, including development of ground water resources . . . utilization of existing water sources . . . application as well as proper equipment designed to meet specific conditions. Layne service to industry, agriculture and municipality has made Layne the world's largest developer of ground water resources—and that fund of knowledge is yours without cost or obligation when you "ask the man from Layne."

LAYNE & BOWLER, INC.

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water wells • vertical turbine pumps • water treatment

Layne

THERE'S JUST NO END TO THE END USES OF CONTINENTAL RED SEAL® POWER

Within Continental's range, from two to 1,100 horsepower, it would be hard to name a type of engine-driven product—vehicle, aircraft, boat, or industrial machine—of which one or more of the leading makes do not rely today on Continental power. As might be assumed from the current trend toward greater specialization, the list of such applications is longer than ever before. The field of Red Seal usefulness has broadened to the point where—as this list suggests—there is almost no end to the industrial uses of dependable Continental power.

●

Air Compressors . . . Air Conditioners . . . Airplanes . . . Backfillers . . . Balers . . . Binders . . . Blowers . . . Buses . . . Bulldozers . . . Combines . . . Commercial Boats . . . Concrete Mixers and Pavers . . . Conveyors . . . Cranes . . . Crop Dusters . . . Derricks . . . Ditchers . . . Drill Rigs . . . Earth Borers . . . Earth Movers . . . Electric Welders . . . Elevators . . . Ensilage Cutters . . . Excavators . . . Farm Tractors . . . Gathering Pumps . . . Graders . . . Hay Loaders . . . Heavy Engine Starters . . . Helicopters . . . High Lifts . . . Hoists . . . Industrial Tractors . . . Irrigation Pumps . . . Loaders . . . Lumber Carriers . . . Materials Handlers . . . Oil Field Machinery . . . Parcel Delivery Trucks . . . Pile Drivers . . . Pipe Benders . . . Portable Generators . . . Rail Cars . . . Rollers . . . Rock Crushers . . . Saw Mills . . . Separators . . . Shovels . . . Snow Plows . . . Sprayers . . . Street Flushers . . . Street Sweepers . . . Threshers . . . Trainer Aircraft . . . Transit Mixers . . . Truck Tractors . . . Warehouse Trucks . . . Winches, and many others.

Continental also builds 4-cycle air-cooled models, from 2 to 3 h.p., for many industrial and farm applications, both conventional and vertical shaft. (AU series illustrated.) Advanced engineering gives them easy starting, high dependability, and unusual lugging capacity at low speeds. For information, address Air-Cooled Industrial Engine Div., 12800 Kercheval Ave., Detroit 15, Mich.

●

SERVICE FACILITIES AND GENUINE RED SEAL PARTS ARE AVAILABLE EVERYWHERE

Continental Motors Corporation

MUSKEGON • MICHIGAN

6 EAST 45TH STREET, NEW YORK 17, NEW YORK • 6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3817 SOUTH SANTA FE AVENUE, LOS ANGELES 58, CALIFORNIA • 910 SOUTH BOSTON STREET, ROOM 1008, TULSA, OKLAHOMA • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GEORGIA

Butyrate means pipe that is lightweight

Tenite Butyrate's light weight speeds installation. Three men can lay 4,000 feet of 4" Tenite pipe in a day. Eight men usually are needed to handle the same amount of metal pipe.

Butyrate means pipe that resists corrosion

You can bury Tenite Butyrate pipe and never worry about corrosion failures. Tenite resists corrosion by sour crudes, salt water and electrolytic soils.

Butyrate means pipe that resists paraffin clogging

You can prove to yourself that the smooth wall of Tenite Butyrate pipe offers no toe holds for paraffin. Install a test section like this in your present metal line.

What could Tenite Butyrate mean to you?

TENITE BUTYRATE PIPE means different things to different users. To a man troubled by corrosion, Tenite means pipe that resists the corrosive conditions found in oil fields. To a man pumping high-paraffin crude, Tenite means relief from the frequent cleaning of paraffin-plugged lines. To a man laying a long string, Tenite means a lightweight pipe —easy to handle, simple to join. Tenite means other things, too . . . greater flow with less load on pumps, good impact resistance, flexibility to follow the contours of the earth, less year-'round maintenance.

Tenite Butyrate can promise long, trouble-free service for your crude, brine and water disposal lines. Get the facts on Tenite. Learn how, in field after field, Tenite pipe has proved its practical value. Mail the coupon for more information and a list of Tenite pipe suppliers. EASTMAN CHEMICAL PRODUCTS, INC., Kingsport, Tennessee, subsidiary of Eastman Kodak Company.

TENITE

BUTYRATE

an Eastman plastic

EASTMAN CHEMICAL PRODUCTS, INC.

KINGSPORT, TENNESSEE

Please send me information on TENITE BUTYRATE PIPE and a list of companies manufacturing Tenite pipe and fittings.

NAME .....

POSITION .....

COMPANY .....

STREET .....

CITY ..... STATE .....

OG6-55

there's

Clark HMA-10, 440 bhp "Midget Angle" equipped for a 3-stage gas lift application.

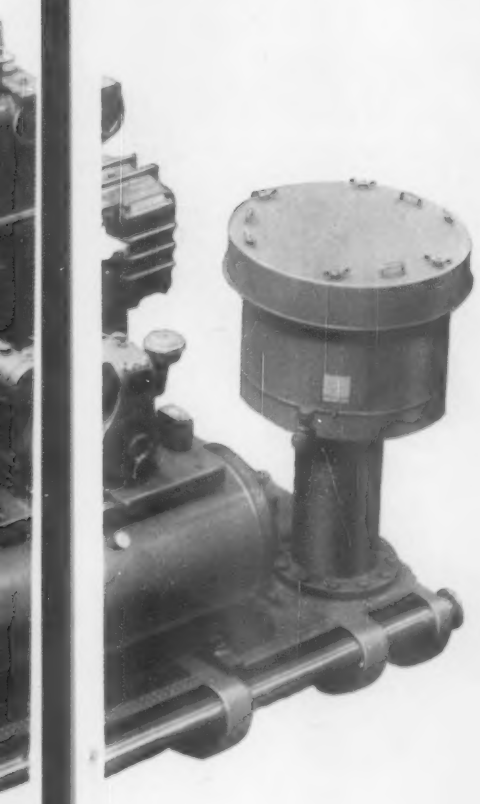
CLARK®

"Midget Angles"

Clark sets the pace in compressor progress

no basis for comparison

In selecting a packaged compressor for field use, *nothing* can be compared with Clark "Midget Angles." They stand alone on so many important points. There's just no *basis* for comparison.



DESIGNED SPECIFICALLY FOR FIELD SERVICE
Every operator knows how important this is in the tough kind of service a field compressor gets.

COMPLETELY FACTORY-PACKAGED
All units fully assembled and tested in the *Clark* plant.

HIGHWAY WIDTH
Most units can be transported, fully assembled, by truck trailer and railroad.

SINGLE RESPONSIBILITY
No buck passing! All major components are built and guaranteed by Clark.

PERFECT BALANCE
Clark Balanced/Opposed principle permits operation anywhere with little foundation.

TWO-CYCLE INLINE DESIGN
For maximum power, ruggedness, simplicity, accessibility and long oil life.

RESERVE OVERLOAD CAPACITY
Ample stamina to handle temporary overloads.

RUGGED, VERTICAL-AIR-FLOW RADIATOR
Clark-built. Unequaled in durability. A Perfect Match for these "Midget Angles." Prevailing wind direction can be disregarded.

MASSIVE, RIGID, ALL-STEEL SKID
Constructed entirely of I-Beams up to 18 inches in height. (Nearly 300 ft. of them in an HMA-10 skid.)

PRECISION CONSTRUCTION
Quality materials and precision workmanship assure continuous operation with minimum maintenance.

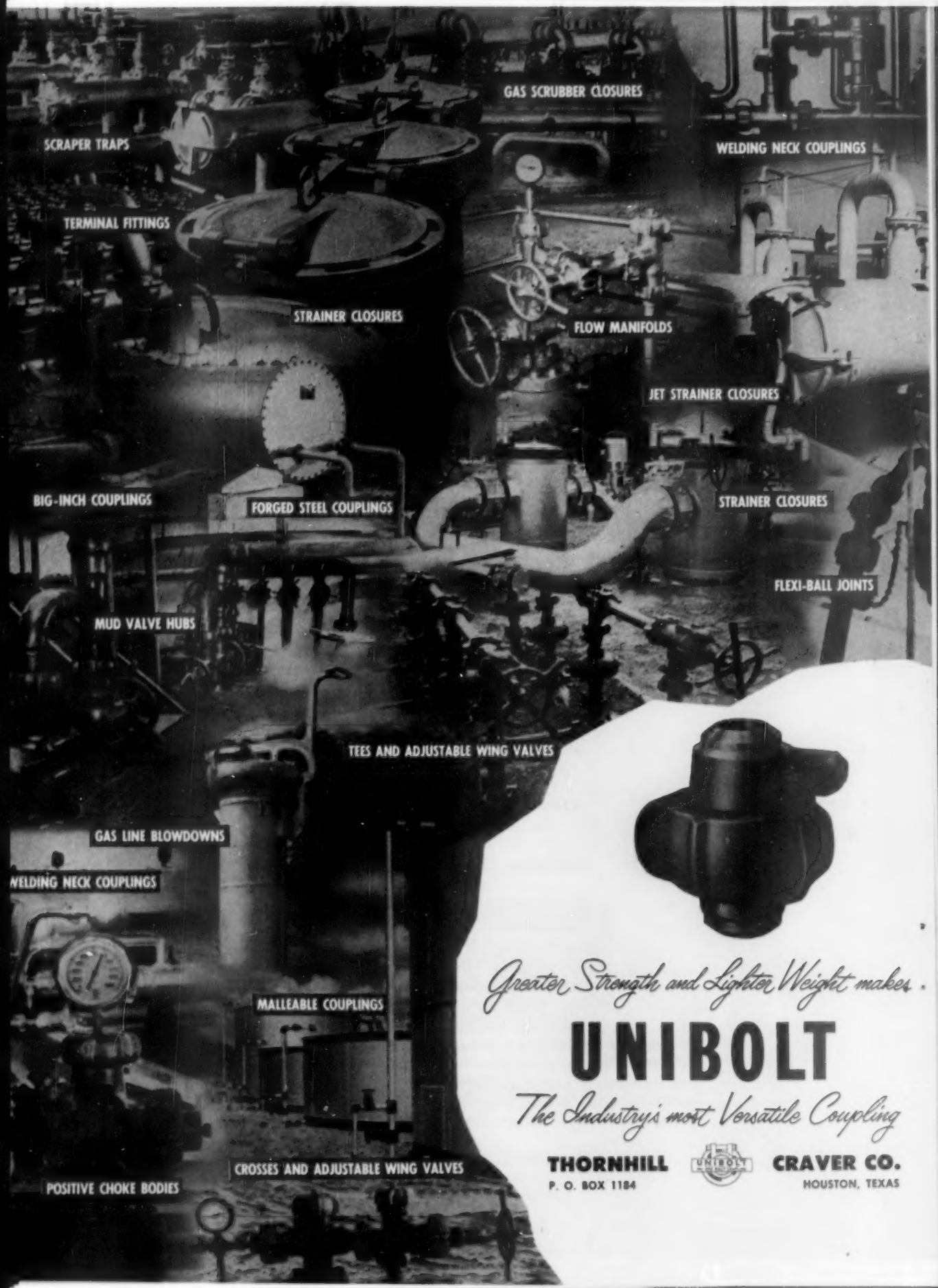
ECONOMICAL TO INSTALL
Only a simple slab of concrete, for leveling the unit, is needed to put the "Midget Angle" on stream.

HUNDREDS OF INSTALLATIONS
Used throughout the world in every conceivable type of service.

For field gas gathering, gas lifting, repressuring, recycling plant feeders, pipeline testing and many other field uses, Clark Midget Angles are the most economical answer in the 85-440 bhp range . . . *and Clark can deliver them in a hurry!* Your Clark representative will give you facts and figures. Write for Bulletin 126.

75 YEARS

CLARK BROS. CO. • OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Sales Offices in Principal Cities Throughout the World



Greater Strength and Lighter Weight makes

UNIBOLT

The Industry's most Versatile Coupling

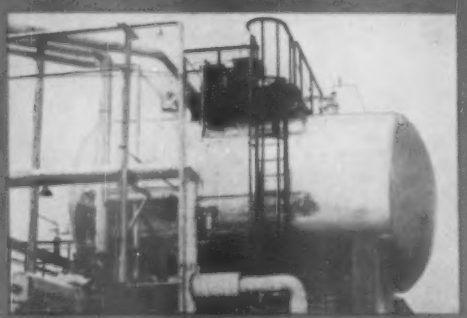
THORNHILL CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS

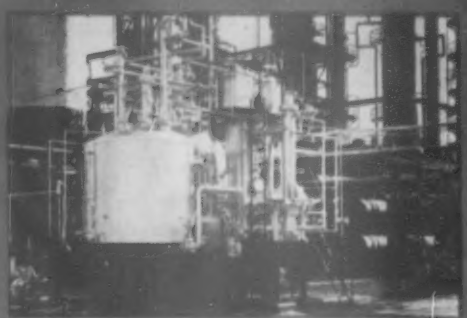
get higher profits, lower operating costs, reduced maintenance, better space use with

PETRECO®

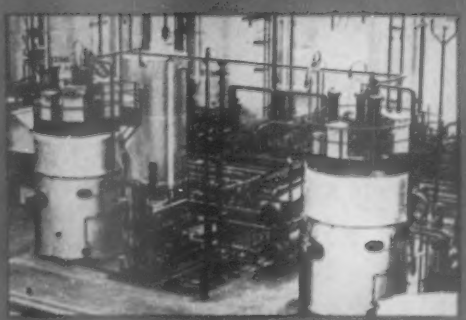
ELECTRIC PROCESSING



Petreco pioneered electric desalting and is the recognized leader in the field. Petreco offers a wide choice of desalting plant design, horizontal, vertical or spherical, all equally efficient.



Petreco distillate treating offers refiners an improved method for acid-contacting, caustic-scrubbing or doctor-treating. This new process is compact, continuous and automatic.



Petreco lube oil treating provides continuous, automatically-controlled acid treatment for lubricating oil and similar stocks. Operating in a closed system, it saves time, acid, space and guesswork.

Petreco desapontification removes soap-forming free caustic or sodium naphthenate soaps from heavy fuel stocks, enabling them to be marketed advantageously or used as a cracking charge.

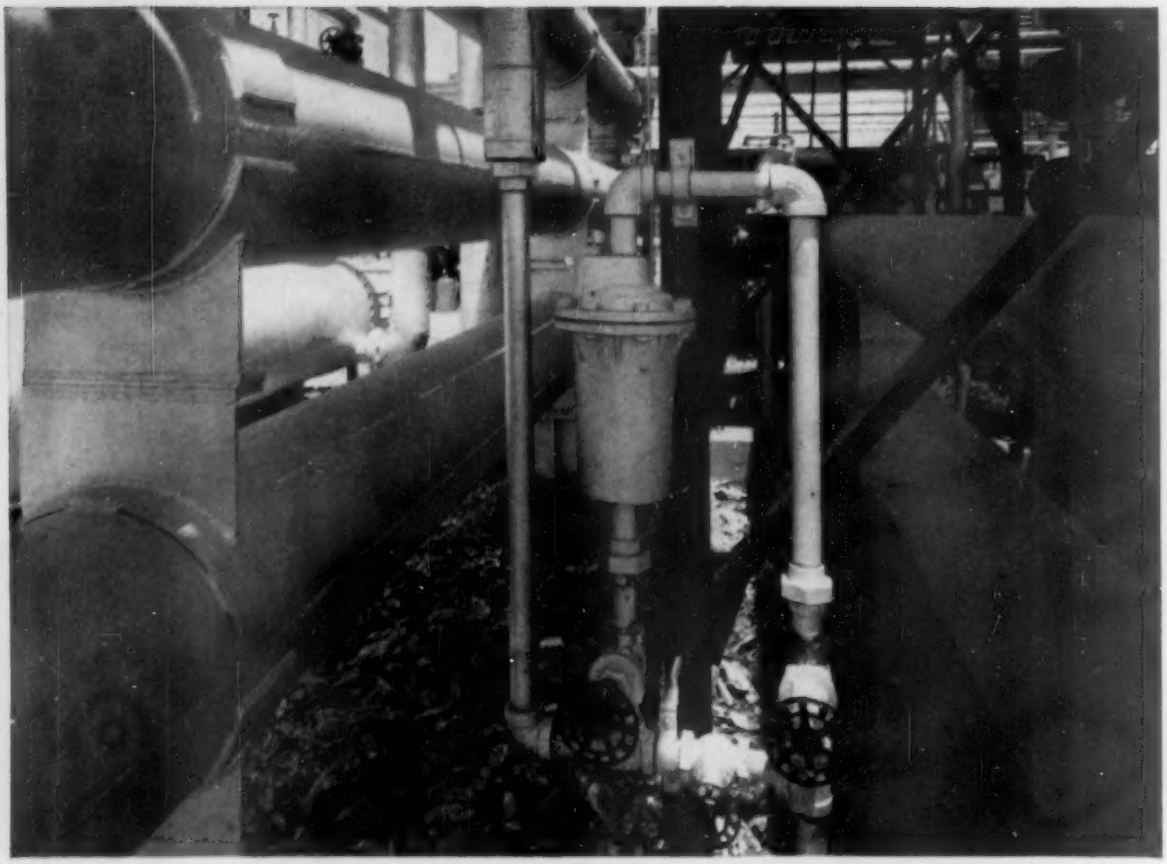
For complete information, write or call

PETRECO

A DIVISION OF PETROLITE CORPORATION

3202 South Wayside Drive, Houston 1, Texas • 1390 East Burnett Street, Long Beach 6, California

AR-2



A Trap Designed to Make the P. A. Happy*

P. A. States The Case. The Purchasing Director of a midwestern refinery says: *"The lowest price bid is sometimes not the most economical or desirable one. Often a proper evaluation of other factors reveals quite the contrary to be the case. What we are after is to obtain the lowest overall cost of operating units. Therefore, the first cost of any piece of equipment must be considered together with such other factors as maintenance, safety, durability, flexibility, etc."*

*On the above basis Armstrong traps are certainly designed to please the Purchasing Agent as well as the Superintendents, Engineers, Steamfitters and Maintenance Men:

Installation. Armstrong offers side inlet-side outlet or bottom inlet-top outlet traps in sizes up to 1¼" so hook-ups can be made with minimum labor and fittings. All traps can be equipped with internal check valves, and the three smallest sizes are available with integral strainers. These optional built-in features mean lower installation costs.

Durability. Valves and seats are file-hard chrome steel, ground and lapped together. The other parts are corrosion-resistant stainless steel. Mechanisms in low and medium pressure traps are identical in design, materials and workmanship to those used in traps for 900°F, 900 psig!

Maintenance. Armstrong traps seldom require maintenance. And, they are easily inspected or repaired simply by removing the cap to which the entire mechanism is connected. The body stays in the line. To make a trap new again, simply install a repair assembly straight from the factory production line.

Safety. Every fine-grained cast semi-steel trap is factory-tested at 500 W. S. P. For great resistance to fire, shock and explosion Armstrong offers a complete line of forged steel traps starting at only $20.00 list.

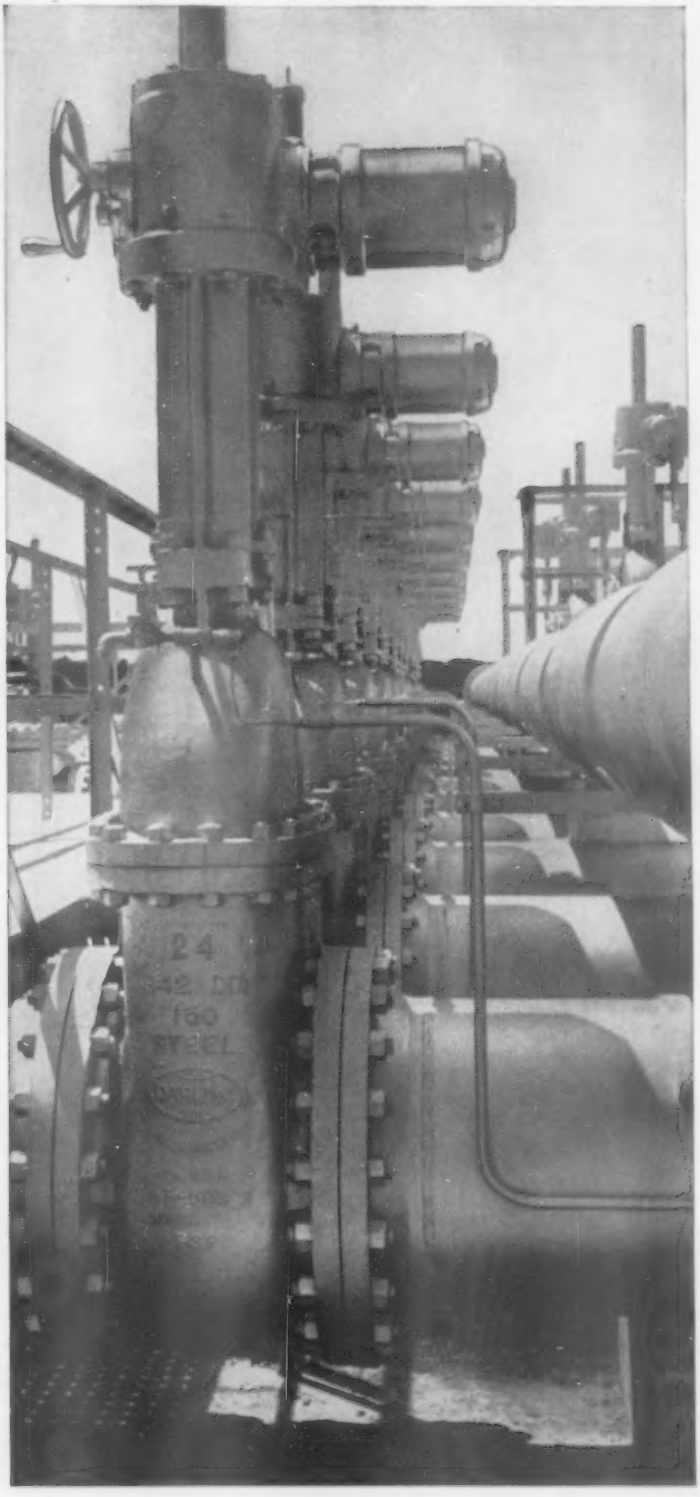
For lowest cost in the long run, Armstrong traps are your best buy. Call your nearby Armstrong Representative or write:

ARMSTRONG MACHINE WORKS
868 Maple Street, Three Rivers, Michigan

Application Engineered
ARMSTRONG STEAM TRAPS

ASK FOR CATALOG J
44-pages of trapping facts and figures, how-to-do-it data and useful information. Free on request.

365



DARLING VALVES

How to line up a *cost-important* principle

THESE Darling gate valves have one thing in particular no other gate valves can match—Darling's *fully revolving double disc, parallel seat principle.*

What does this mean?

Skipping to end results . . . smoother, easier valve operation . . . automatic compensation for valve body distortion to assure tight closure . . . and avoidance of wear concentration areas on both discs. In turn all this just naturally adds up to longer valve life, surer performance, less maintenance, less part replacement, less down time, and lower over-all operating cost.

These gains are a matter of record—the real reason why Darling valves today are picked for so many oil and gas line jobs. Give us an idea of your service needs and get complete, specific details on the Darling valves that can do the *best* kind of a job for you!

Line-up of Darling 24" motor-operated steel gate valves at a major crude oil pumping station. Here, as elsewhere, Darling's fully revolving double disc feature pays off.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

SMOOTH SERVICING

ON DEEP WELLS

MOGUL *Torcair* 42 Single or Double Drum Winch

CAPACITY: SERVICING WELLS TO 10,000 FEET With 2½-Inch Tubing, Without Hydromatic Brake — **SERVICING WELLS TO 16,000 FEET** With 2½-Inch Tubing, With 15" Double Rotor Hydromatic Brake . . . **AND NOTE THESE:** • FULL AIR CONTROLS • FULL OIL BATH CHAIN DRIVES • LOWER DRUM BRAKE RINGS 42" x 8½" • WILSON QUALITY THROUGHOUT • TORQUE CONVERTER APPLICATION —

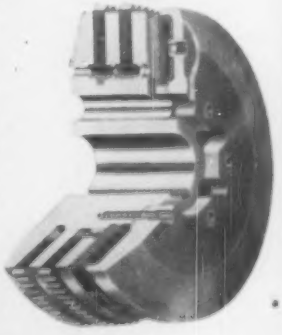
Either a Torcon Torque Converter, Twin Disc or GM Converter can be used with any single engine Torcair Rig or Winch.

Complete Portability! Under 8 Feet in width!

Be Modern - Buy Wilson

ALL DRIVES EQUIPPED WITH

WICHITA AIR-TUBE DISC CLUTCHES



This type of clutch combines all the advantages inherent in air operation, such as convenient remote control, small manual pressure required for full torque, smooth starting and controlled torque. In addition, it gives freedom from self-engagement or reduced capacity, due to centrifugal force; and has much greater torque capacity than radial type air clutches. No packing to leak or let water or oil into the clutch friction surfaces. All air connections are on the outside and easily accessible. This without a doubt the finest clutch yet developed for this type service, providing great capacity in minimum space, no adjustments, practically impossible to burn up. **SMOOTHEST ENGAGEMENT OF ANY AIR CLUTCH!**

HYDROTARDER BRAKE APPLICATION

HYDROTARDER: The Mogul unit can be equipped with the 15" Double Rotor Type Hydromatic Brake driven by a chain drive from the countershaft. This brake can be used with either upper or lower drum, and when used on main drum with five lines strung up will absorb a total of 1300 H.P. when dropping the stands at the rate of 60 feet in 12 seconds. This is the equivalent of 16,000 feet of 2½" tubing. The brake is so arranged that it will absorb very little power when taking up the empty blocks and jaw clutch does not need to be disengaged to take up the empty blocks when the trip is completed.

Wilson

The FIRST NAME in OIL FIELD WINCHES

WILSON MANUFACTURING CO., Inc.

The HOME of RED IRON • Wichita Falls, Texas

HYDRAULICS FOR MOBILE EQUIPMENT

VOL. 2

Mobile Equipment News

VICKERS INCORPORATED, DETROIT, MICHIGAN

IMPROVES PERFORMANCE • CUTS COSTS

NO. 5

New! VICKERS® HYDRAULIC POWER STEERING BOOSTER...SERIES S23

LATEST DEVELOPMENT in POWER STEERING for TRUCKS, BUSES, MATERIALS HANDLING VEHICLES, ROAD CONSTRUCTION and MINING MACHINERY

More compact . . . improved in operating characteristics . . . this new Vickers Steering Booster, Series S23 is an important new development in power steering for many vehicles. Application is much easier because it requires less space . . . and ultimate costs are substantially lower. Series S23 thus opens the way to fingertip ease of steering for a wide range of additional vehicles.

Like the preceding models, Series S23 has hydraulic lock against road shock. Bumps, chuckholes, blown front tires, obstructions, etc., cannot spin the steering wheel or jerk it out of control. This is a safety factor of great importance.

Series S23 Boosters are provided either with (Model S23R) or without (Model S23N) an integral relief valve. Model S23N is used with Vickers VT16 and VT17 pumps that have integral volume control and relief valve. When the larger volume Series V200 pump is used and a volume control is required in the circuit, the S23N is used with a separate combination valve (see Series FM2 below). Model S23R is used with the Series V200 pumps that have no integral valving, for applications where a volume control is not required.

ASK FOR NEW BULLETIN M5106

MORE VERSATILE INSTALLATION

In Series S23 Boosters, the servo ball stud housing is symmetrical, and can be assembled in any one of four positions. This and the compactness of the Booster makes application easier . . . increases the number of applications which can be made without major engineering changes. Series S23 Boosters can be mounted interchangeably with Models S6-277 and S6-279 Boosters.

REQUIRES LESS SPACE

The new booster has been reduced in size by the redesign of the servo control valve. The tube connecting the servo valve to the rod end has been relocated and is now on the same side as the fitting connection. As a result of these changes, Series S23 requires less space . . . works in closer quarters.

7062

VICKERS Incorporated

DIVISION OF THE SPERRY CORPORATION

1448 OAKMAN BLVD. • DETROIT 22, MICH.

Application Engineering Offices: ATLANTA • CHICAGO AREA (Brookfield) • CINCINNATI • CLEVELAND • DETROIT • HOUSTON LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Summit, N. J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • ROCHESTER • ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA WASHINGTON • WORCESTER

VICKERS VOLUME CONTROL and OVERLOAD RELIEF VALVE

Five sizes of Series FM2 Valves were developed primarily for hydraulic power steering on trucks, buses and materials handling equipment where the pump does not include a volume control valve. The FM2 improves steering booster performance by providing a relatively constant volume of oil regardless of engine speed variations. An integral relief valve is included.

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

What is your Control Need?

. . . a starter for a fractional hp motor?

This small inexpensive control provides thermal overload protection. . . . Compact construction permits mounting where space is at a premium. Designed for use on ac single-phase power systems . . . up to 230 volts.

. . . a controller for a 2300 to 5000-volt motor?

Here is a control for motors up to 2500 horsepower. All components — contactors, meters, overload relays, auxiliary switches — are selected to meet the particular requirements of your application. Current-limiting fuses give split cycle short circuit protection.

. . . or other applications?

Specific applications, including those between the above-mentioned limits, are made from an extensive line of starters and control components. These standard units are factory assembled in infinite combinations to meet practically any requirement. For help on a particular application, call your Allis-Chalmers representative. His recommendations are backed by Allis-Chalmers engineering departments . . . by experience gained solving thousands of control problems . . . by complete research and testing facilities.

A-4721

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

RECTOR SLIP PACKOFF ASSEMBLY

for Type RH Casing Head

...lowers through blowout preventer

...seals before preventer is removed

...sets and seals simultaneously

Rector Type "RH" Casing Head with Type "SP" Slip Packoff in position. Standard Rector Welding Ring and API ring gasket are used in the usual manner to provide the famous Rector metal-to-metal seal.

The Type "SP" Slip Packoff Assembly gives the operator everything desired in a casing head setting and sealing arrangement. It provides the safety and convenience of setting casing without removing the Blowout Preventer, plus the permanent, leak-proof advantages of the famous Rector metal-to-metal seal . . . a good weld, plus API Ring Gasket.

The Type "SP" Slip Packoff is wrapped around the pipe, latched and lowered through the Blowout Preventer into the seat in the Rector RH Casing Head. Special floating ribs in the slip segments contact the casing head bowl and hold the slips in position to assure positive engagement of slip teeth with the casing as it is lowered for final setting.

The compressible sealing element directly above the slips has a bottom retainer ring attached to the ribs. An upper retaining ring is attached to the slips by Allen Head Bolts. The ribs hold the bottom retainer ring in a fixed position. As the slips move downward with the pipe, the sealing element is compressed by the upper retainer ring, which moves downward with the slips. This effects a positive seal at the same time the setting is made and without removing Blowout equipment.

Ask your Rector Representative or Supply Store about the new Type "SP" Slip Packoff Assembly. It is available for our Type RH Casing Heads in all popular pipe sizes.

RECTOR WELL EQUIPMENT COMPANY INC

★ MAKING THE OIL INDUSTRY SAFER ★

1100 NORTH COMMERCE ST FORT WORTH, TEXAS

Houston Plant: 2215 Commerce St.

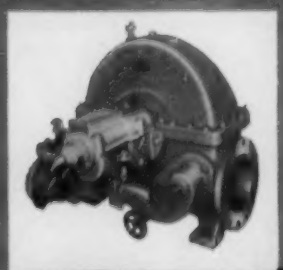
REPRESENTATIVES IN ALL ACTIVE FIELDS

RECTORHEAD RECTORSEAL

up to 100% more power

added to DH turbines

More power from the same size unit! Dean Hill presents an improved DH Line of horizontal turbines which produce up to twice the power of former counterparts.



The major change contributing to this tremendous power increase is the addition of one or more steam nozzles to all models, with these results . . .

1. The new, two-nozzle DH-10 and DH-20 turbines have *double* the maximum horsepower of former units.

2. Models DH-30, DH-40 and DH-45, now with three nozzles, are rated 50% higher in maximum horsepower.

FULL INFORMATION AVAILABLE

Many other improvements have been made on the five DH Models, adding to the quality and performance of Dean Hill Horizontal Turbines. A new catalog completely describes these models, and this information will be sent you on request.

Write Today For Dean Hill's New Turbine Catalog No. 500.

DEAN DH HILL PUMP COMPANY

Pump and Turbine Engineers Since 1893

Indianapolis 7, Indiana

Sales Offices in

Chicago, New York, San Francisco, Boston, Cincinnati, Denver, Albuquerque, El Paso, Salt Lake City, New Orleans, Philadelphia, Tulsa, Los Angeles, Pittsburgh, Houston, Detroit, St. Paul, Toledo, Cleveland, Grand Rapids, Birmingham, Ala., Louisville, Memphis, Jacksonville, Richmond, Bogota, Col., Mexico City, Montreal, Bandung, Pin., The Hague

STOP RUST!

Resists Salt Air, Salt Water, Sun, Heat, Fumes, Blowing Dust and Sand—Yet Dries Quickly and Hard to a High Gloss Finish!

Do the job right in the field—right over the sound rusted surface! Just scrape and wirebrush to remove rust scale and loose rust – then brush or spray Rust-Oleum 769 Damp-Proof Red Primer (or H-50 Primer) over the remaining rust. Then—follow-up with the Rust-Oleum finish coat to match the original manufacturer's colors. That's all there is to it. Applied over rust—Rust-Oleum keeps your equipment looking better . . . LONGER!

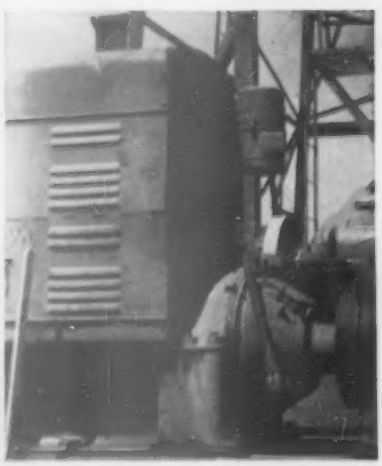
Rust-Oleum is *exclusive*, incorporating a specially-processed fish oil base that penetrates rust to bare metal. It dries right, is free of objectionable odor, is ready-mixed and self-leveling. Specify genuine Rust-Oleum. Accept no substitutes. Many leading industrial oil field supply distributors carry complete stocks for your convenience.

with

RUST-OLEUM®

and match original equipment

COLORS



FOR FREE TEST SAMPLE—ATTACH TO YOUR LETTERHEAD AND MAIL TO: RUST-OLEUM CORPORATION 2545 OAKTON ST., EVANSTON, ILL.

Please Send Me a FREE TEST SAMPLE to Match the Following Color: (check sample desired)

- ☐ Test Sample of 769 Primer to be applied directly over rusted surface
- ☐ Test Sample of CATERPILLAR YELLOW
- ☐ Test Sample of NEW NATIONAL BLUE
- ☐ Test Sample of NEW UNIT RIG GRAY
- ☐ Test Sample of NEW EMSCO GREEN
- ☐ Test Sample of BETHLEHEM YELLOW
- ☐ Test Sample of WAUKESHA GRAY
- ☐ Test Sample of OIL WELL ORANGE
- ☐ Test Sample of OLD EMSCO GREEN
- ☐ Test Sample of READY-MIXED ALUMINUM
- ☐ Test Sample of HIGH GLOSS WHITE
- ☐ Test Sample of QUICK DRYING BLACK
- ☐ Nearest Source of Supply
- ☐ Complete Literature and Color Charts.

WEED PROBLEMS?

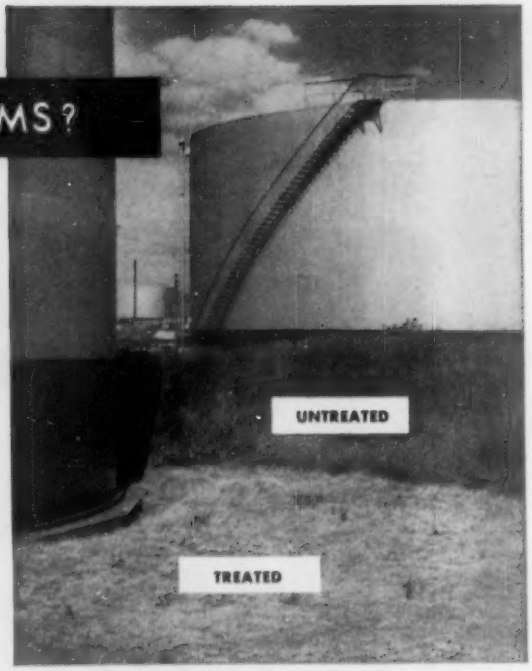
One application of

Du Pont Telvar®

WEED KILLERS

stops weeds for the season—or longer!

"Telvar" kills weeds through the roots . . . prevents regrowth. Low rates (20 to 80 lbs. per acre) make it cost little for the results you obtain . . . also mean less handling, fewer storage problems. To cut maintenance costs to new low levels, put "Telvar" in your weed-control program. Available in two formulations: "Telvar" W, and "Telvar" DW.



"Telvar" is ideal for weed control around tank farms, pipelines, pumps and derricks. It's non-toxic to humans and animals, non-flammable, non-volatile and non-corrosive to equipment.

BRUSH ON RIGHT-OF-WAY?

Brush along this pipeline was cleared and kept down with "Ammate." "Ammate" allows low-growing cover to return to resist erosion.

One application of

Du Pont Ammate®

WEED AND BRUSH KILLER

kills more kinds of brush —safely—at lower cost!

"Ammate" kills more kinds of brush and keeps it down longer than most weed and brush killers! When the original spray job is done well, brush is kept under control for years with only an occasional spot spray. You can rely on "Ammate" to do the job safely, even where your right-of-way adjoins cropland, because "Ammate" is not volatile. There are no vapors to drift onto sensitive crops. It is no hazard to crews, stock or wildlife.

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. For your copies, write to Du Pont, Grasselli Chemicals Dept., Rm. D-4032, Wilmington, Del. In Canada, Du Pont Company of Canada Limited, Box 660, Montreal.

On all chemicals always follow directions for application. Where warning or caution statements on use of product are given, read them carefully.

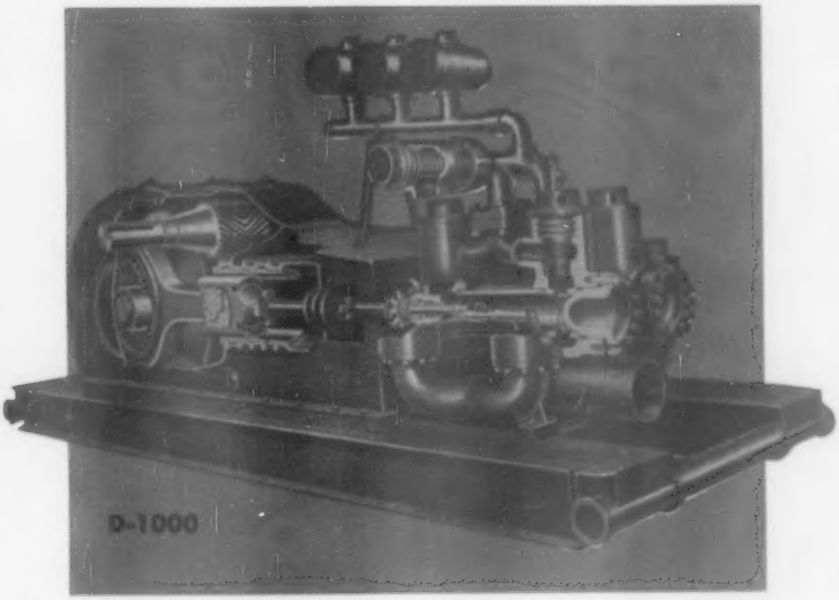
Telvar® Weed Killers for industrial use

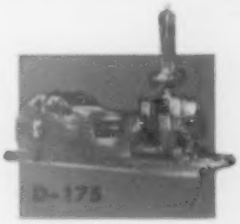
DU PONT REG. U. S. PAT. OFF.

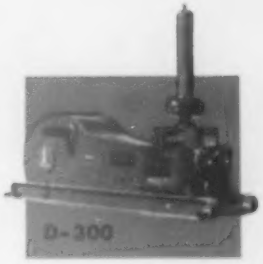
Ammate® Weed and Brush Killer

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

NEW 1000 HP PUMP . . . ADDED TO THE ALL-STEEL EMSCO LINE







EMSCO
D-1000

Pound-for-pound EMSCO provides more pumping capacity than any other pump on the market today. Compact design means greater economy in transportation . . . easier handling at the rig. EMSCO features provide high efficiency, long service life and low cost operation.

PESA

For complete information contact your nearest Mid-Continent Supply Company store or representative.

MID-CONTINENT Supply Company

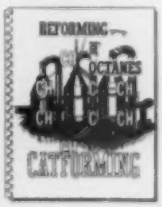
MID-CONTINENT BLDG. FORT WORTH, TEXAS

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

CATFORMING *means*

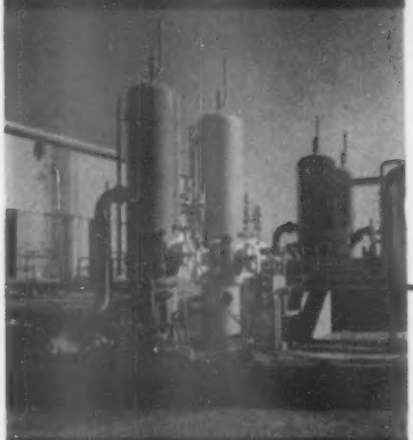
High Octanes...
High Yields...
Low Cost...
Proved Performance

These advantages of Atlantic Catforming are being demonstrated again and again in different commercial installations. We invite you to share in the benefits of Catforming. Please phone, write or wire for our detailed brochure, "CATFORMING." The Atlantic Refining Company, Research and Development Dept., P. O. Box 8138, Philadelphia, Pa.



ATLANTIC *It's the Catalyst that counts*

It's no effort at all to reach the internals of this Peerless Gas Odorizer through the Sillers Flex-Ring Closure.

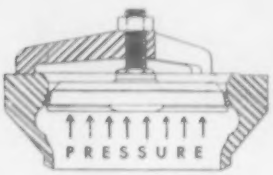


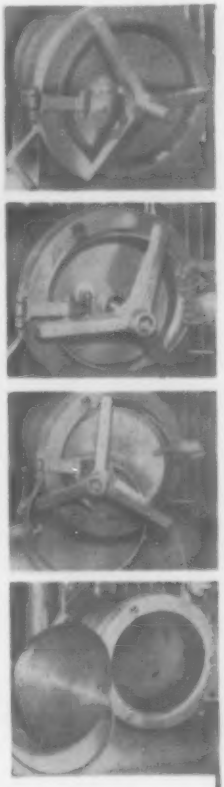
Sillers Flex Ring Closures are utilized on these large scrubbers at a Field Processing Plant in South Texas.

Here is a typical Sillers Flex Ring Closure installation on a Sillers Scraper trap on a products pipeline in Eastern Oklahoma.

SILLERS FLEX RING CLOSURE

for faster access to the inside of pressure vessels or piping . . .





(1). Flex Ring Unit assembled as in service. (2). Spider released, gasket being removed. (3). After gasket is removed, plug is rotated to open. (4). Unit completely opened and in a fraction of time taken for conventional type closures.

SIMPLE and SAFE to OPERATE...

An entirely new design and seal principle, the SILLERS FLEX RING CLOSURE gives you many advantages and economies such as LOW INITIAL COST . . . LESS TIME IN OPENING AND CLOSING (JUST ONE BOLT) . . . TIGHTER SEAL AT HIGH PRESSURES . . . LESS WEIGHT . . . EASE OF HANDLING . . . and NO SEAL DESTRUCTION IN CASE OF FIRE. Sillers Flex Ring Closures are available in all standard sizes and can quickly be adapted for special applications.

GET COMPLETE DETAILS TODAY
SEND FOR BULLETIN NO. 3000

The perfect closure for Boilers, Evaportors, Heat Exchangers, Autoclaves, Filters, Strainers, Absorbers and all types of Pressure Vessels and Piping Systems.

FOR USE ON

BOILERS
EVAPORATORS
HEAT EXCHANGERS
FILTERS
STRAINERS
ABSORBERS
PRESSURE VESSELS

SILLERS ENGINEERING COMPANY

Division of Peerless Manufacturing Company

BOX 13165 DALLAS, TEXAS

Representatives in Principal Cities

THERE'S NO ROOM FOR VAPOR TO FORM IN A HAMMOND TUBESEAL FLOATING ROOF TANK

The Hammond Tubeseal Floating Roof is different from all other floating roofs because its design and construction does not provide space where air-vapor mixtures can form.

All floating roofs now in general use, except the *Hammond Tubeseal*, provide a space between the shell of the tank and the outer rim of the roof where air-vapor mixtures form.

If a sour crude is stored in a conventional floating roof tank, excessive corrosion of the tank shell and rim plates will occur where air-vapor mixtures form. Unless the metal shoes and flexible fabric covers provide an absolutely gas-tight housing, some of the vapor will be lost. If the stored product is of intermediate volatility such as jet fuel (JP-4 grade) combustible vapors will exist in this space under all normal atmospheric temperature ranges. Any ignition as from lightning will cause violent combustion.

The Hammond Tubeseal eliminates this space and prevents the forming of any air-vapor mixture. Corrosion is stopped even for sour crudes. Jet fuels such as JP-4 grade may be stored with assured safety from rim fires. *Vapors which cannot form cannot ignite or be lost.* There is no room where vapor can form in a Hammond Iron Works Tubeseal Floating Roof.

Sales Offices:
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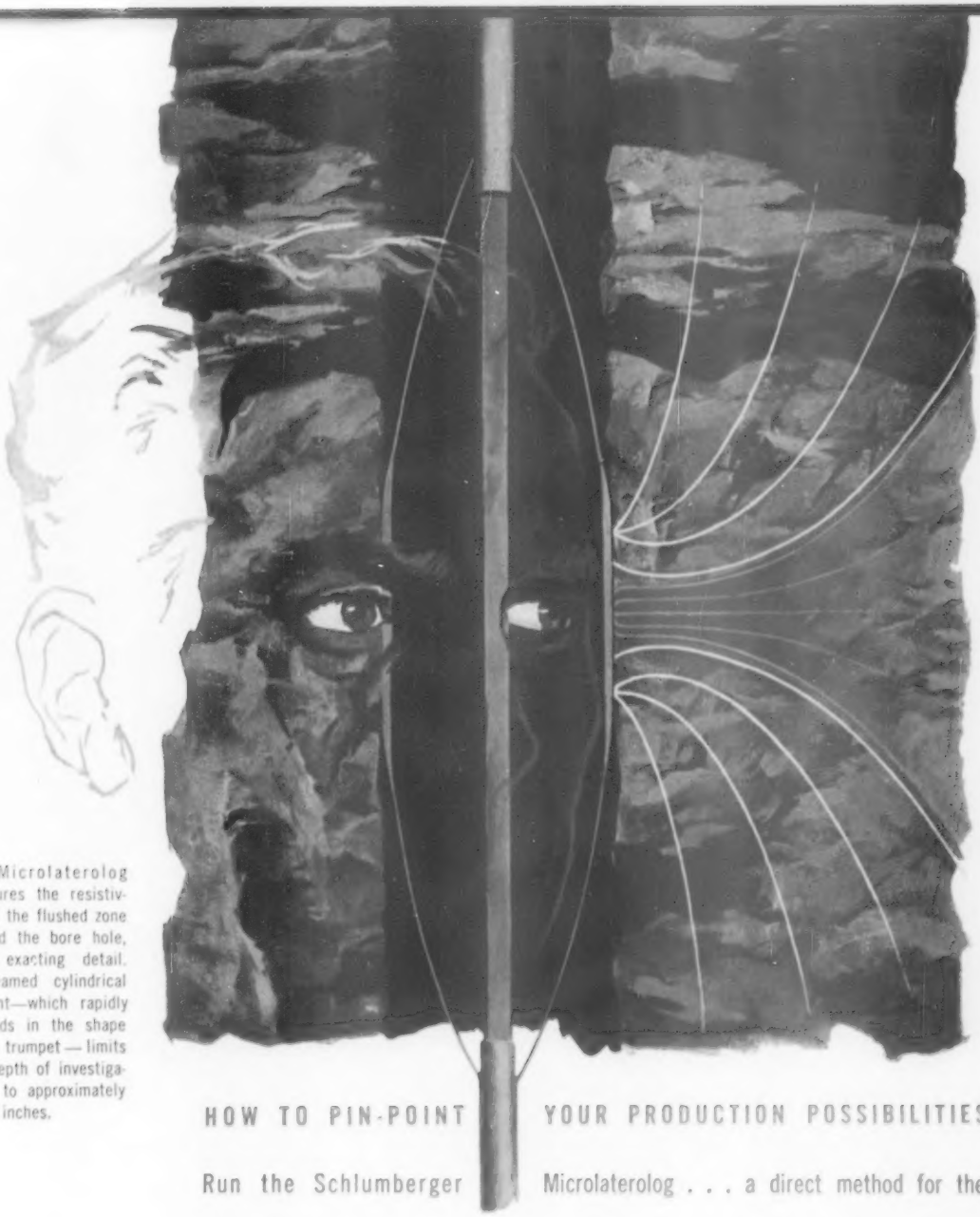
HAMMOND TUBESEAL COSTS NO MORE IN THE FIRST PLACE

The most efficient and positive seal known.

no moving parts • no mechanical maintenance • overcomes tank out-of roundness • climate proof • non-corrodible • can operate to bottom of tank or above the top • no vapor space below the seal • entire circumference has tight seal under pressure at all times.

CHEAPER OVER THE YEARS

HAMMOND IRON WORKS
WARREN and BRISTOL, PA. • PROVO, UTAH
CASPER, WYO. • BIRMINGHAM, ALA.



The Microlaterolog measures the resistivity of the flushed zone around the bore hole, with exacting detail. A beamed cylindrical current—which rapidly expands in the shape of a trumpet—limits the depth of investigations to approximately three inches.

HOW TO PIN-POINT YOUR PRODUCTION POSSIBILITIES

Run the Schlumberger Microlaterolog . . . a direct method for the calculation of porosity—and a valuable aid in electrical log interpretation. Resistivity values from the Microlaterolog lead directly to an evaluation of formation factor and porosity. This information, coupled with data from the conventional electrical log, or the laterolog, makes it possible to calculate the oil saturation in the reservoir.

CALL YOUR LOCAL SCHLUMBERGER ENGINEER FOR FURTHER DETAILS

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Well Surveying Corporation

wherever you are...
Frontier delivers the goods

GEARED TO SERVE THE OIL INDUSTRY
with plants at
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WICHITA, KANSAS
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Wherever you're producing or refining . . . in the Permian Basin, Rocky Mountain, Williston, Mid-Continent or Southwest . . . Frontier delivers your basic chemicals *on schedule*. Frontier's handy plant locations save transportation time and costs. Frontier quality meets your specifications. And Frontier truck-trailer and tank-car service delivers the goods . . . dependably.

CAUSTIC SODA (liquid, flake, solid) • MURIATIC ACID • CHLORINE
99% PURE SALT (fine grain for drilling mud; briquette for process uses)

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DIVISION OF UNION CHEMICAL & MATERIALS CORPORATION

The leader has lengthened its lead!

From the day it was announced, the Marsh Mastergauge took the lead in the pressure gauge field. You are probably well aware of this . . . but do you realize that we have constantly given it plus qualities to still further *lengthen* its lead?

Look at the recent developments presented opposite. Unquestionably these are the three greatest strides in gauge development since the creation of the Marsh "Recalibrator."

Yes, the three basic gauge components have been brought to a remarkable stage of perfection in the Mastergauge. Certainly, for every critical service there is no gauge to compare with it!

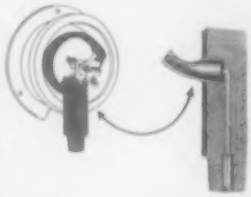
Mastergauge is standard bearer for the world's broadest line of gauges and dial thermometers, each the best of their kind in the applications for which they are recommended. Ask for data covering your specific needs.

MARSH INSTRUMENT CO. *Sales Affiliate of Jas. P. Marsh Corporation* **Dept. L, Skokie, Ill.**
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta

ONLY MARSH HAS THE "RECALIBRATOR"

MARSH

THE STANDARD OF ACCURACY

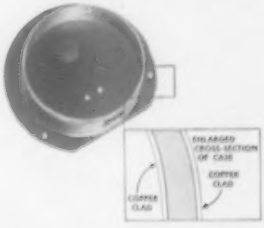


1—A better tube construction—

The Mastergauge always had the most effective joining of the bourdon tube to the socket . . . but . . . *one-piece construction is always better!* Welding these dissimilar parts posed a tough problem . . . but we finally solved it by a new process—the "Conoweld" process—exclusively ours. The photo of an actual section shows the perfect fusion. Socket, tube—even the end-piece—are fused into one leak-tight unit.

2—A better movement—

To convert the action of the bourdon tube into accurate pressure indication, the gauge movement must be rugged, practically frictionless, highly resistant to corrosion. A self-lubricating effect is achieved in the Mastergauge movement by using alternate stainless steel and monel—gears stainless, bushings "K" monel, and so on. A distinguishing feature is the "coined" sector gear. Note broad face of gear which results from this coined extrusion.



3—A better case—

Another development that has increased Mastergauge leadership is the new copper-clad, wrought steel case. The case has the strength of steel and the resistance to corrosion of copper. It is four times as strong as a cast iron case and one-third lighter. Final finish is a handsome corrosion resistant black enamel. Every case is fitted with Marsh safety blow-out plug—a typical advancement.

KERMAC
The Right Men and Equipment for any Drilling Job...
ON LAND AND AT SEA
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OIL INDUSTRIES, INC.
General Offices • Oklahoma City
KERMAC

It's a small world...

when you fly a *Learstar* WORLD'S FASTEST EXECUTIVE AIRLINER

LS-4

PRODUCED BY LEAR, INCORPORATED, AIRCRAFT ENGINEERING DIVISION, SANTA MONICA, CALIFORNIA • THE LEARSTAR IS A MODIFICATION OF THE FAMOUS LOCKHEED LODESTAR

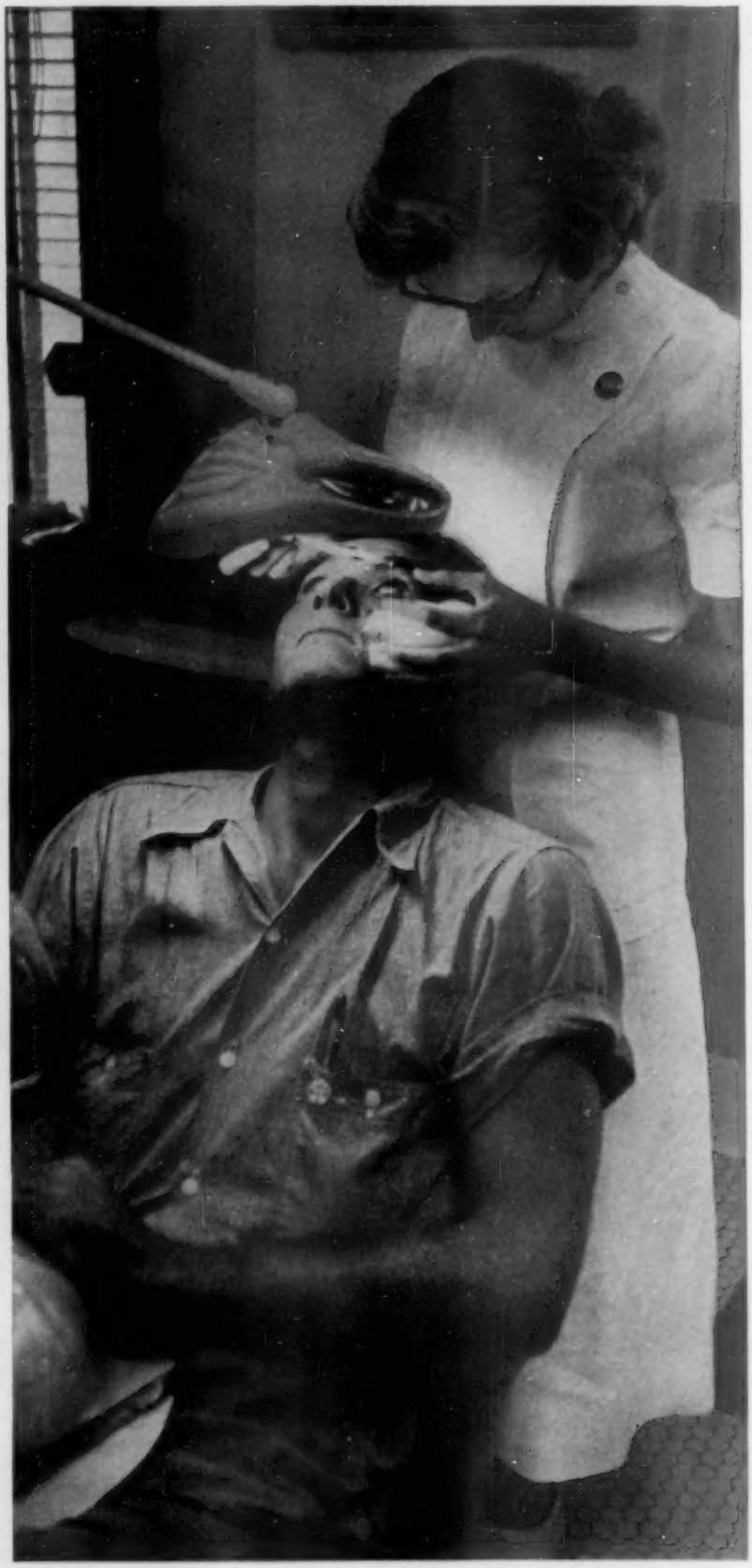
Oil woman...

She is one of the most important "oilmen" there is, although she may not work with a tank gauge or on a tank farm. Accidents can happen in any job. And when they do—the refinery nurse knows just *what* to do.

Whether it's a cinder in an eye . . . a cut finger . . . a broken leg . . . no matter *what* it is, she's there to help get emergency service under way. That's why it's important—and mighty comforting—to have her around.

The Texas Company

TEXACO



WHAT HAPPENS NEXT?

If management has been wise, a fire tragedy will be stopped before it starts...if not, in 20 minutes extensive destruction and total loss could readily be the result.

First-rate fire protection is essential to the continued success of any business. With C-O-TWO Smoke or Heat Fire Detecting Systems, plus C-O-TWO High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing Systems, as well as PYRENE Air Foam Type Fire Extinguishing Systems for specific outdoor locations, your plant can have fast, positive round-the-clock fire watchman service simultaneously at each fire hazard point . . . a fire tragedy is stopped before it starts.

Furthermore, there is a personal sense of responsibility inherent with PYRENE—C-O-TWO Fire Protection Engineers that assures you of fully adequate firesafety . . . a definite plus in your behalf. Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . PYRENE—C-O-TWO means top quality backed by experienced engineering that results in operating superiority for you at all times.

Act now . . . don't take unnecessary chances with your investment any longer . . . the extensive experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Remember . . . a plant-wide fire protection survey skillfully executed today could be the means for greater profits tomorrow.

Pyrene

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Sales and Service in the Principal Cities of United States and Canada

C-O-TWO

COMPLETE FIRE PROTECTION

portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM

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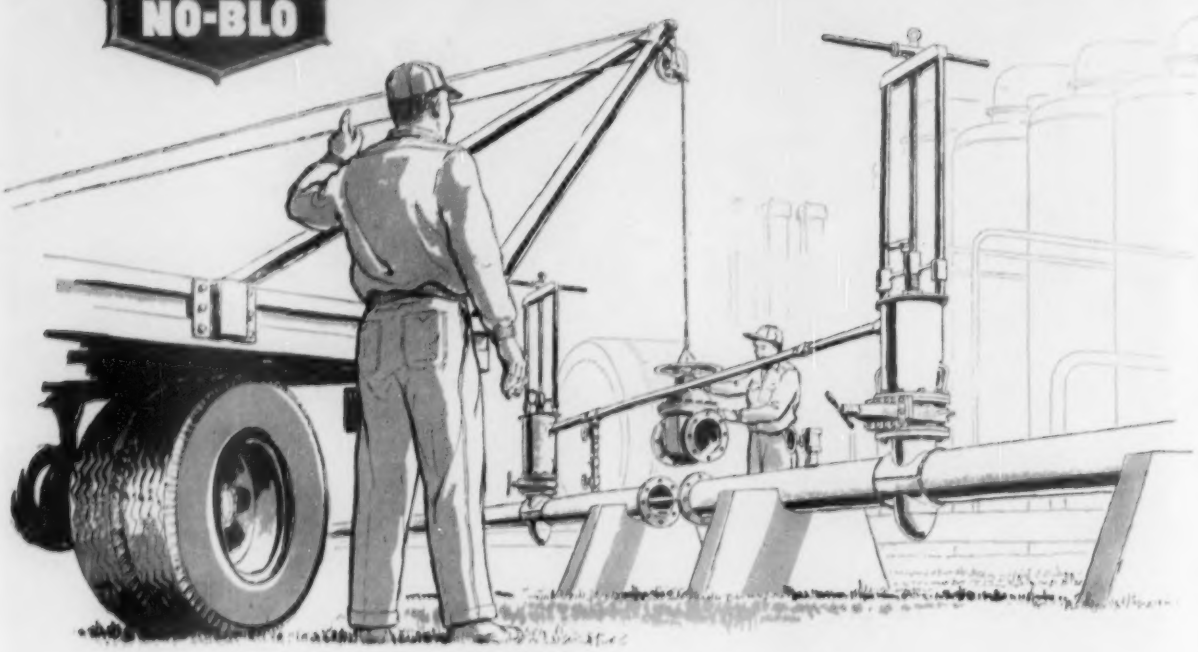
NO-BLO



ISOLATE LINE SECTIONS!

Here is a typical No-Blo set-up for isolating a section of line to permit repair, relocation or tie-in without interrupting flow.

Two 8"* line stopper fittings have been attached to the line at the location desired. Next, the pipe within the fitting was removed with a shell cutter and Mueller drilling machine. Cylindrical stoppers were then inserted into the fittings and expanded to give positive shut-offs and isolate the section. Flow has been diverted through the stoppers into the pressure chambers of the stopping machines and across the built-in by-pass line. (A larger, separate by-pass could have been used.) All operations have been completed safely under pressure with no loss of fluid.

**Line Stopper Sizes*

Service Line Stoppers	¾", 1", 1¼"
Unit No. 1	1½", 2"
Unit No. 2	3", 4"
Unit No. 3	6", 8"
Unit No. 3 SW	6", 8"
Unit No. 4 SW	10", 12"

(SW indicates neoprene-covered steel wedge stoppers—small stoppers are made of solid rubber.)

Contact your Mueller Representative or write direct for full details and specifications of Mueller No-Blo Line Stopper Fittings and Equipment.

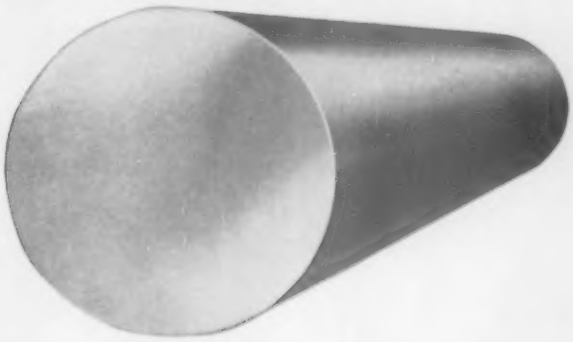
MUELLER CO. DECATUR, ILL.

Dependable since 1857

FACTORIES & OFFICES AT DECATUR · CHATTANOOGA · LOS ANGELES · SARNIA, ONTARIO

When you make hollow parts . . .

Why use bar stock?



start with seamless tubing

Save steel, machining time!

WHY bore out bar stock to make hollow parts when Timken® seamless steel tubing lets you start production with the center hole already there? You don't waste steel and you save machining costs, too. Finish boring is often your first production step. Screw machine stations can be released for other jobs. So you add machining capacity without adding machines. And you save money because you pay only for the steel you use.

Our engineers will save you even more money, too, by studying your problem and recommending the most economical tube size for your hollow parts jobs, guaranteed to clean up to your finished dimensions.

You also get fine forged quality in Timken seamless steel tubing. The piercing process by which it is made is basically a forging operation.

It gives the tubing a uniform spiral grain flow for greater strength, and a refined grain structure which brings out the best in the quality of the metal. The Timken Company's rigid quality control keeps this quality uniform from tube to tube and heat to heat. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD — THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

The New Rotary Drilling Line

HAZARD

Lay-Set

VHS

15% Stronger

Users Are Enthusiastic Over Rotary Drilling Lines of Lay-Set VHS . . . New Wire Rope That's 15% Stronger, Tougher, More Wear Resisting.

DRILL DEEPER

Rotary Drilling Lines made from new Lay-Set VHS wire rope are at least 15% stronger than Improved Plow Steel which has been the strongest grade available up to now. This means you can drill to a greater depth before increasing the number of parts of line. You can make round trips faster.

TOUGHER, LASTS LONGER

In addition to its greater strength, new VHS wire is tougher. It resists deformation . . . spools better on drums . . . keeps its shape for longer periods of service.

COSTS LESS TO USE

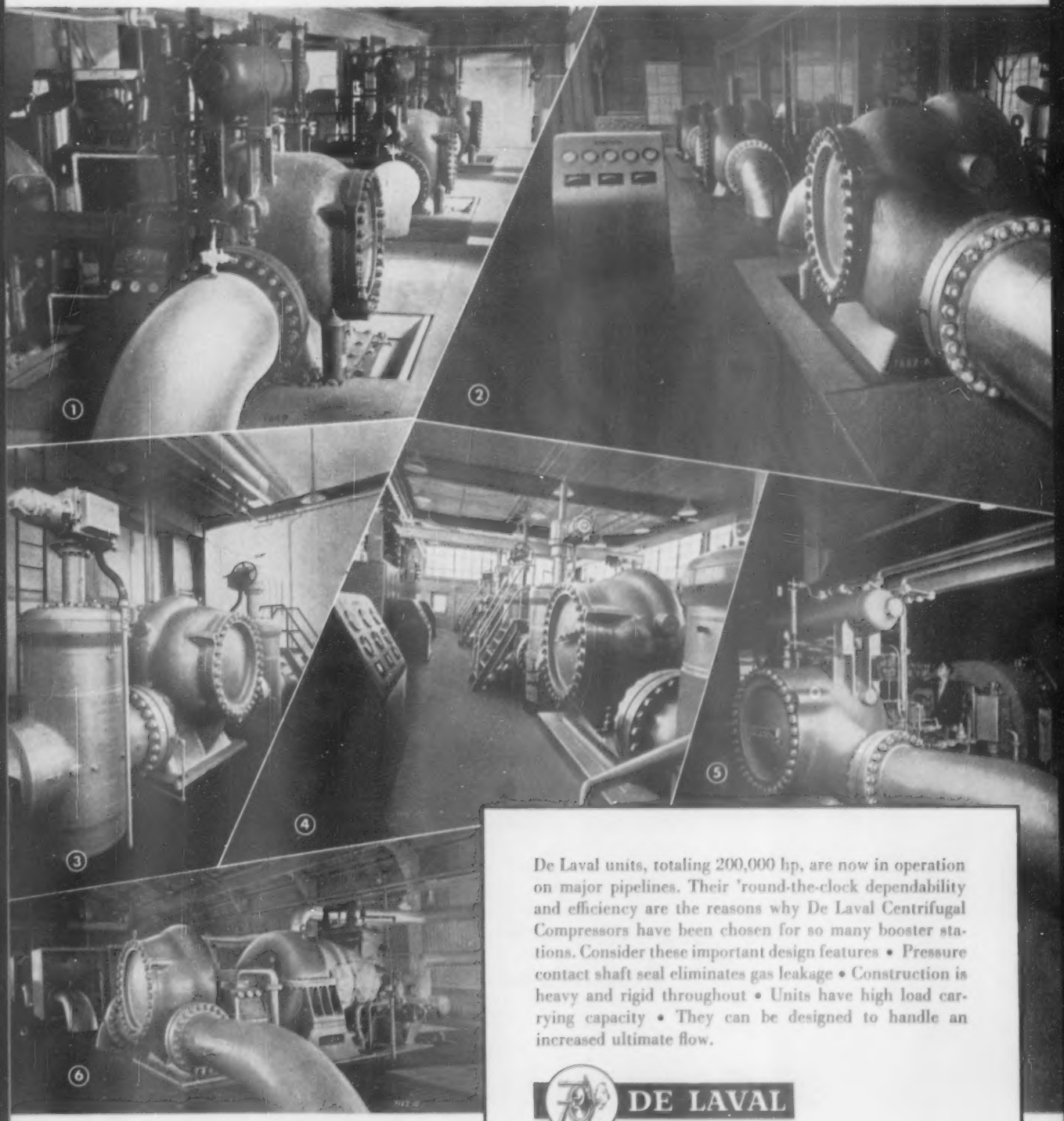
VHS has greater resistance to abrasion and wear and operators can safely extend the ton-miles between cuts by following recommended practices. This means more ton-miles per foot of rope. It cuts costs by increasing service life and reducing "down-time" for drilling line replacement. Compare VHS with any other drilling line made.

Ask your Hazard Distributor for Lay-Set VHS or write the nearest Hazard office for a copy of Brochure DH 490

HAZARD WIRE ROPE DIVISION
American Chain & Cable Company, Inc.

PLANTS: Houston, Tex., Wilkes-Barre, Pa.
OFFICES AND WAREHOUSES: Odessa, Tex., San Francisco, Portland, Ore., Pittsburgh, Philadelphia, New York, Los Angeles, Denver, Chicago, Atlanta • Bridgeport, Conn.

These pipelines depend on DE LAVAL *Centrifugal Compressors*



Located in booster stations of:

1. *Northern Natural Gas Company*
2. *El Paso Natural Gas Company*
3. *Southern Counties and Southern California Gas Companies*
4. *Texas Eastern Transmission Corporation*
5. *United Gas Pipe Line Company*
6. *Transcontinental Gas Pipe Line Corporation*

De Laval units, totaling 200,000 hp, are now in operation on major pipelines. Their 'round-the-clock dependability and efficiency are the reasons why De Laval Centrifugal Compressors have been chosen for so many booster stations. Consider these important design features • Pressure contact shaft seal eliminates gas leakage • Construction is heavy and rigid throughout • Units have high load carrying capacity • They can be designed to handle an increased ultimate flow.

DE LAVAL

Centrifugal Compressors

DE LAVAL STEAM TURBINE COMPANY

810 Nottingham Way, Trenton 2, New Jersey

DL-307

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Breeds On Satisfactory Experience!

Record Sales Prove That Oilfield Production Men Everywhere Have Confidence In BS&B Equipment!

Confidence is not something that is given freely . . . nor can it be bought with rash promises backed by slipshod performance!

Where it concerns oilfield production equipment, Confidence is something that must be *earned* by well-kept promises backed by *actual field performance* as good or better than anticipated. In short, Confidence breeds on satisfactory *experience!*

During our more than 60 years of service to the industry, BS&B has become one of the world's leading manufacturers of oilfield production equipment and has won the Confidence of Oilfield Production Men the world over by delivering equipment that is unsurpassed for efficiency and reliability. Next time, buy BS&B . . . and see!

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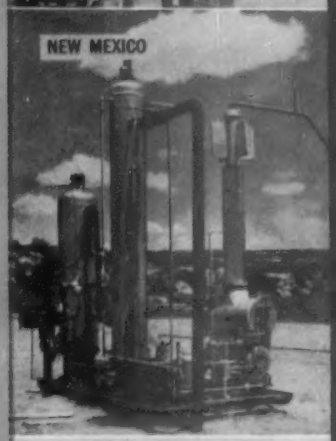

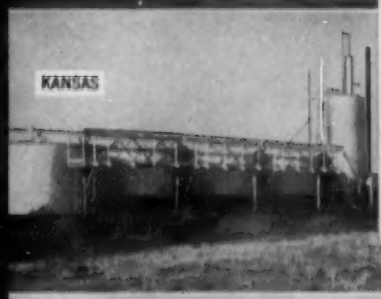

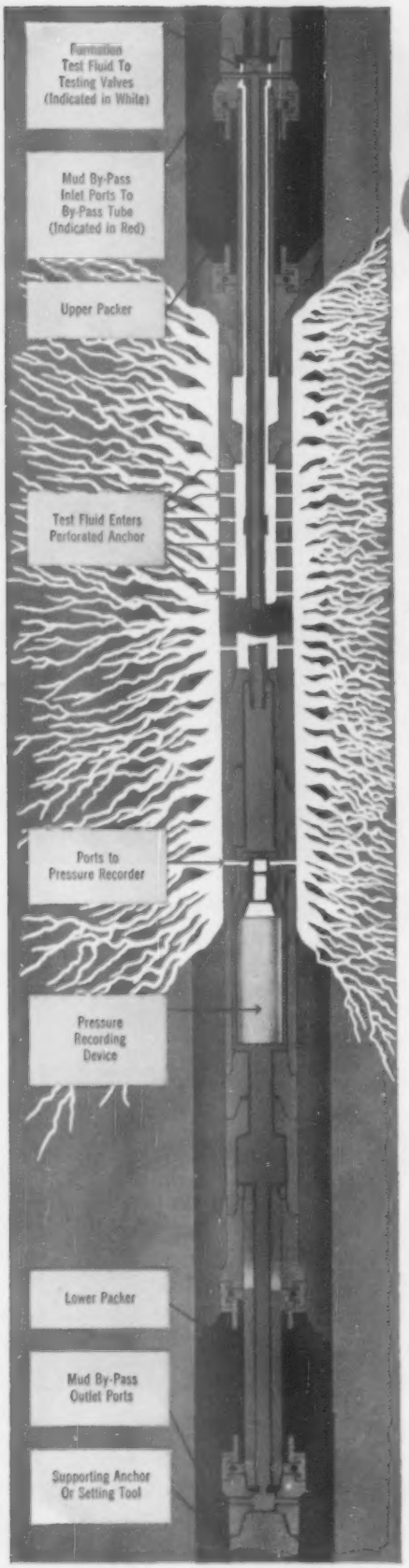
Formation Test Fluid To Testing Valves (Indicated in White)
Mud By-Pass Inlet Ports To By-Pass Tube (Indicated in Red)
Upper Packer
Test Fluid Enters Perforated Anchor
Ports to Pressure Recorder
Pressure Recording Device
Lower Packer
Mud By-Pass Outlet Ports
Supporting Anchor Or Setting Tool

Straddle Testing

in open hole
another Johnston first*

Now, with complete confidence, you can...

- EVALUATE UP-THE-HOLE ZONES
- LOCATE GAS, OIL, AND WATER CONTACT
- HELP PROTECT HOLE AND SUPPORTING ANCHOR

See how Johnston Straddle Testing with STRADDLE MUD BY-PASS maintains full hydrostatic mud pressure on upper and lower packers—and on all formations below lower packer. Lessens the load on supporting anchor and prevents production from any lower zone in the event of lower packer failure. Should either packer fail, you get an immediate surface indication. Get all these advantages plus ease of running tool into and out of the hole.

*Johnston Straddle Testing with Straddle Mud By-Pass is covered by patent and patents pending. Another Johnston first!

for descriptive folder write to:

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first in drill stem testing

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HOUSTON, TEXAS

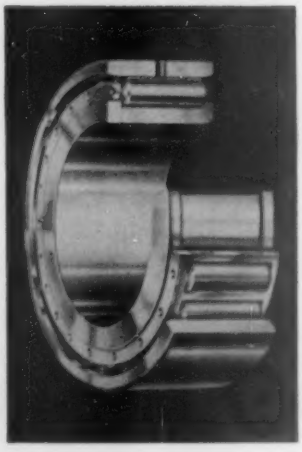
LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON

IN THE OIL INDUSTRY, TORRINGTON *Bearings are used in many applications including slush pumps, rotary tables, draw works, blocks, swivels and pumping units.*

TORRINGTON Radial Roller Bearings

are designed with one-piece bronze retainer that keeps rollers correctly aligned and effectively lubricated



Here are other reasons why TORRINGTON RADIAL ROLLER BEARINGS can meet your load and speed requirements. Only the finest quality steels, heat treated according to the most modern methods, are used in manufacture.

Precision tolerances and finishes on both rollers and races guarantee low eccentricity and uniform load distribution.

One-piece, cast-bronze cages help minimize wear, facilitate lubrication, and lengthen bearing life.

Machined pads in each cage-pocket guide the rollers accurately at the pitchline.

Specify TORRINGTON RADIAL ROLLER BEARINGS for your equipment. They are interchangeable in all types and sizes and custom engineered to meet the toughest, heavy duty assignments.

THE TORRINGTON COMPANY
South Bend 21, Ind. • Torrington, Conn.

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TORRINGTON RADIAL ROLLER BEARINGS

Spherical Roller • Tapered Roller • Cylindrical Roller • Needle • Ball • Needle Rollers

Pipeline Handyman

Loads trench padding into trucks — dumping height of 9ft, 2 in.

Versatile Allis-Chalmers HD-5G Pads Rocky Trench, Moves Light Equipment, Handles Supplies— Saves Time and Money on Dozens of Jobs

At work by the thousands in industry after industry, the Allis-Chalmers HD-5G 1¼-yd Tractor Shovel can be a real money saver for you on your pipeline spreads. With excellent balance and accurate control, this close quarters specialist quickly loads trench padding into trucks. For those jobs where suitable fill is nearby, the HD-5G digs, hauls and dumps the padding into trench — saves dollars by saving hours of hand labor.

Dumps padding into trench, quickly returns for another load.

Quick-Change Attachments Add to HD-5G Versatility

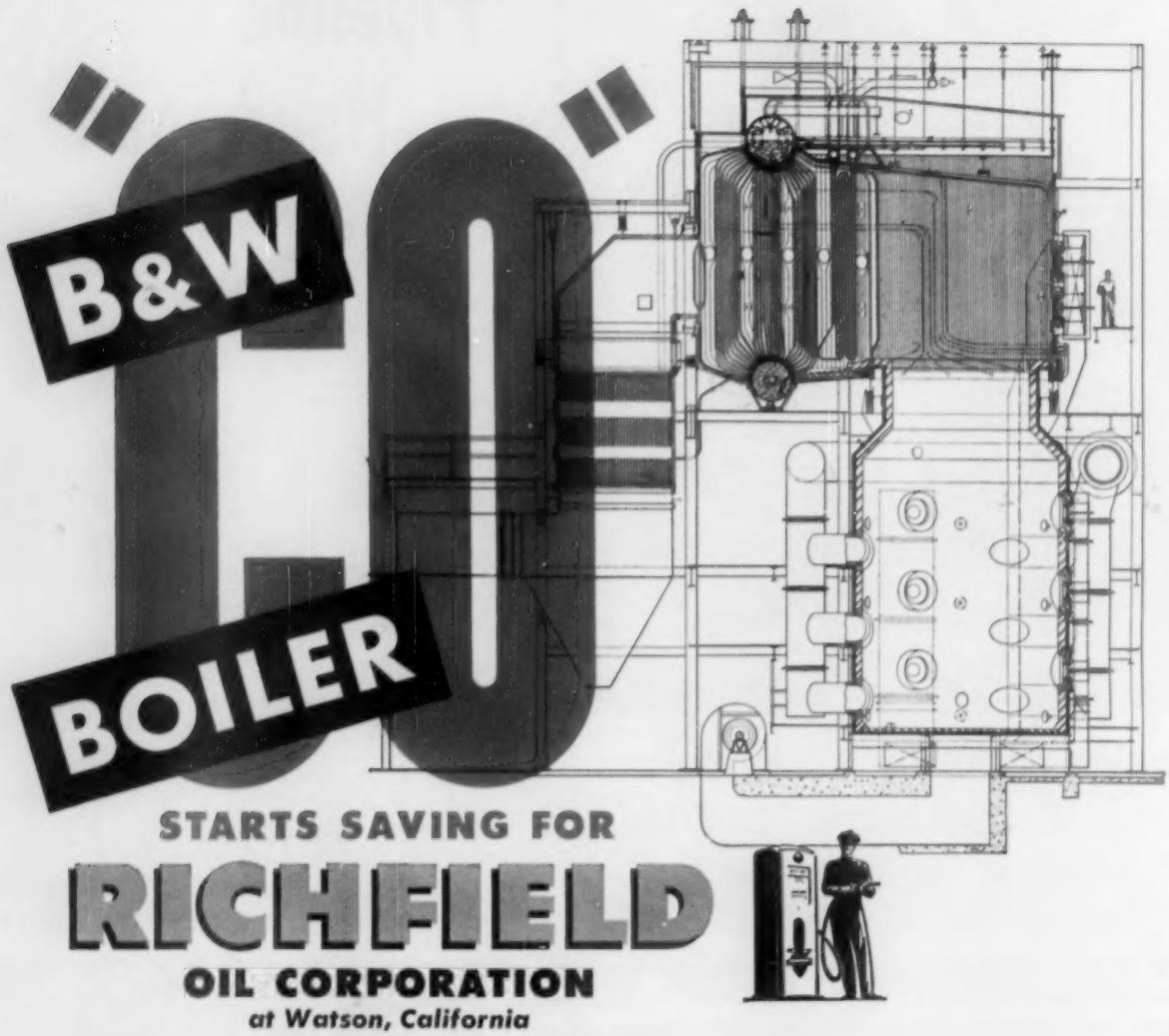
Bulldozer, angledozer, narrow bucket, rock bucket, crane hook, light materials bucket, trench hoe, lift fork, tine fork, rock fork are quickly interchangeable with standard bucket. Rear-mounted hydraulic ripper or winch adds to HD-5G's versatility. With these attachments it can handle skids, drums, valves — speed dozens of jobs in supply yard, around pump house or on the line.

Allis-Chalmers Tractor Shovels are available in four sizes —1¼, 2, 3, and 4-cubic yards. Your Allis-Chalmers dealer is eager to *prove* the outstanding versatility of this machine — with a demonstration *right on the line!* Set a date now or write for new descriptive literature.

For job-to-job moves, the HD-5G is easily transported by truck or trailer — only 6 ft, 6¾ in. wide.

• 50 belt hp • 16,200 lb including bucket

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



STARTS SAVING FOR

RICHFIELD

OIL CORPORATION

at Watson, California

Another big stride in waste heat reclamation was made at Richfield's Watson refinery when their new B&W CO Boiler recently went on stream.

Utilizing the combustible carbon monoxide, as well as sensible heat, from the catalyst regenerator, the CO Boiler saves heat previously expelled to the atmosphere and wasted. From now on this heat will be burned and harnessed—a saving that is reckoned in thousands of dollars.

In addition, the boiler is an independent source of steam power for the entire fluid unit and its auxiliaries—available for steam even when the cracking unit is shut down.

Its maximum continuous capacity is 340,000 lb of steam per hr at a pressure of 600 psi and a temperature of 750 F, burning either oil or gas as supplementary fuels.

G-719

Besides representing a significant economic advance, the CO Boiler is an outstanding example of cooperation among companies with the common goal of lowering operating costs and raising an already outstanding efficiency still higher. C. F. Braun Company, the contractors, Richfield Oil Corp., and B&W—all are major contributors to what is rapidly proving to be a *saving* advance in the petroleum industry. Let us discuss with you and with your consulting engineers the working advantages of the B&W CO Boiler and give you additional details. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX

BOILER DIVISION

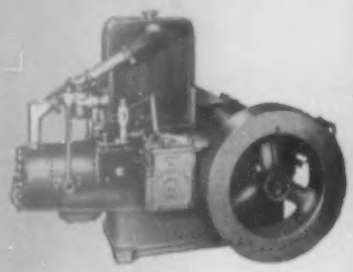
It's a long time between parts with *Ajax*

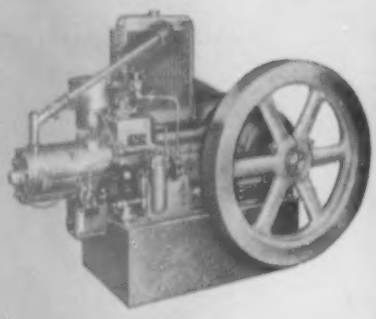
BUT WHEN YOU NEED 'EM THEY'RE RIGHT NEAR BY!

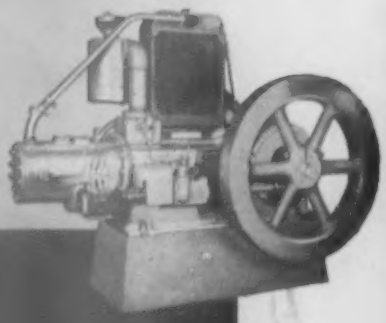
NATIONAL Supply Co.

BETHLEHEM Supply Co.

R. B. MOORE Supply Co.

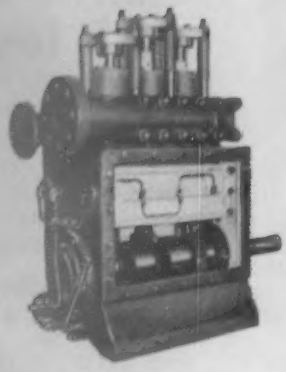






AJAX

GAS ENGINES PRESSURE PUMPS



You get years of service without incident from AJAX Engines and Pumps. Every Ajax part is built for long life in the field under continuous operating conditions. But when you *do* need a replacement item, it's mighty easy to pick up. Just stop at your nearest National, Bethlehem, or R. B. Moore supply store, and you'll find it waiting. ● AJAX units are easy to service, too—almost 80 years of experience in building oil country engines makes sure of that. ● Make sure *your* next pump or engine is an Ajax: see your Supply Man for the detailed facts!

AJAX IRON WORKS

Builders of GAS AND OIL ENGINES, PRESSURE PUMPS, STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

CORRY, PENNSYLVANIA

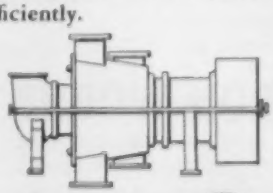
Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA.
R. B. MOORE SUPPLY CO., BOLIVAR, N. Y. • BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA

FACTS on Westinghouse 5000-hp gas turbines . . .

Delivers gas with less horsepower

Gas-turbine-driven centrifugal compressors give high efficiency at high-flow, low-compression ratio. • Stations can be spaced closer together, maintaining a high average pressure with less horsepower. • Any one centrifugal compressor can handle the full flow, so fewer units are required for a given length of pipelines. • Gas turbines are high-speed prime movers—no reduction gears required to drive centrifugals efficiently.

For more information, see your Westinghouse sales engineer, THE MAN WITH THE FACTS, or write for booklet B-5859. Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pa. J-50578

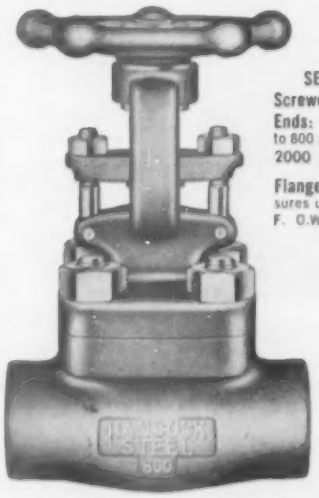


YOU CAN BE SURE...IF IT'S Westinghouse

LET US SHOW YOU WHY

Hancock Steel Gate Valves set the pace in dollar-for-dollar service and value

TYPE 950 HANCOCK 800# STEEL GATE VALVES
Outside Screw and Yoke. Sizes: ¼" thru 2"



SERVICE RATINGS
Screwed and Socket Weld Ends: For all pressures up to 800 psi. at 775° F. O.W.G. 2000 psi.—100° F.

Flanged Ends: For all pressures up to 800 psi. at 775° F. O.W.G. 1440 psi.—100°F.

Install a Hancock 800# Bolted Bonnet Steel Gate Valve in your piping system and prove for yourself why this valve sets the pace in dollar-for-dollar service and value. Hancock Gate Valves have cut valve costs in hundreds of refineries, chemical and petrochemical plants and other installations . . . have proved themselves the best, most economical valve for process and power piping systems. They can mean similar savings for you.

To provide such service and value, Hancock Gate Valves combine two big advantages: specially selected materials for extraordinary long wear under difficult operating conditions and an exclusive design for positive, maintenance-free performance. Features include highly accurate guiding to prevent wedge dragging and consequent leaking, a wedge of "500 Brinell" stainless steel, seat of 11-13% chrome stainless steel, plus a spiral-wound gasket and swing bolt and nuts of stainless steel.

When Hancocks go in, valve costs go down.

GET THE WHOLE STORY about these 800# Hancock Steel Gate Valves from your local Industrial Supply Distributor. His knowledge of valves and their correct application can also save you time and money. Phone him today.

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

HANCOCK VALVES

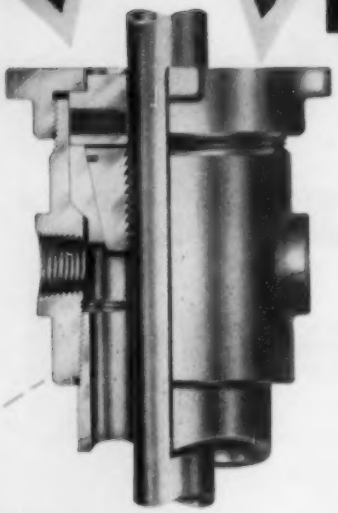
A product of **MANNING, MAXWELL & MOORE, INC.** Watertown 72, Massachusetts

MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, Stratford, Conn. 'CONSOLIDATED' SAFETY RELIEF VALVES, Tulsa, Okla. AIRCRAFT CONTROL PRODUCTS, Danbury, Conn. and Inglewood, Calif. "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, Muskegon, Mich.

A PROGRESS REPORT FROM GULFCO
ON LOW PRESSURE WELL COMPLETION

Problem: How to complete low pressure wells with safety and economy.

answer:



The newest addition to our well head family

the "JEEP"

Available in 4½" and 5½" female full opening and 7" male not full opening for 2" or 2½" tubing, and with two 2" threaded outlets.

Gulfco "JEEP" tubing head with these features:

- Full opening.
- The only head in its class constructed of forged steel.
- The only head in its class free of welds in construction.
- 1,000 lb. C.W.P.—2,000 lb. test.
- Three piece hinged slips.
- Low priced for economy.
- Flexibility in accordance with latest completion, repressuring, fracturing and production practices.
- Double packer for positive seal.

Forged steel well head equipment for safety.

SERVICE from experienced well head men who know their equipment . . . and the job you expect it to do.

Order this rugged forged steel head from your SUPPLY STORE . . . for your future wells.

GULF COAST MACHINE & SUPPLY CO.

GULF COAST MACHINE & SUPPLY CO. GULFCO TRADE MARK PRODUCTS BEAUMONT, TEXAS

GENERAL OFFICE AND SHOP: 305-315 Orange Street, P. O. Box 1150—Phone 2-8481, Beaumont, Texas

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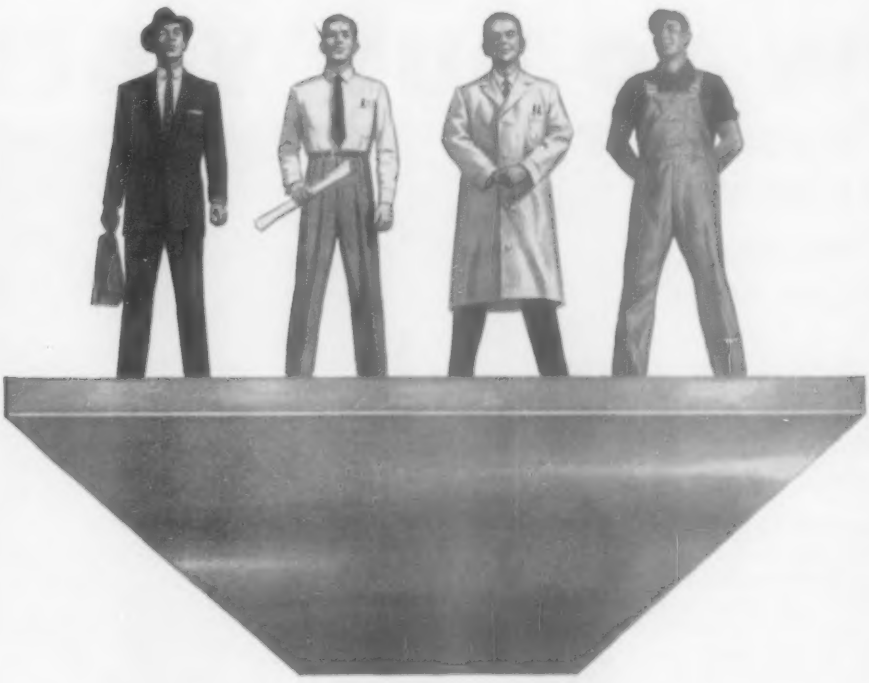
NEW YORK EXPORT OFFICE: R. S. Stokvis & Sons, Inc., 17 Battery Place, New York 4, N. Y.

See Gulfco's 20-page section in the Composite Catalog.



always on top of the job...

It takes more than machines to make steel plates. It takes people. At Claymont, this emphasis on people reflects itself in personalized attention to every order—large or small.

Every step of the way, the handling of your order is under the painstaking supervision of experienced engineers, metallurgists, laboratory analysts, and skilled workmen.

When you order from Claymont you can always count on carbon or alloy plates that are truly tailored to your individual requirements. We make sure of it—because *we're always on top of the job.*

To order—get in touch with our nearest sales office or write direct to Claymont Steel Products Department, Wickwire Spencer Steel Division of CF&I, 813 West Street, Wilmington 99, Delaware.

Claymont Steel Products

Products of Wickwire Spencer Steel Division • The Colorado Fuel and Iron Corporation

CF&I

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OTHER CLAYMONT PRODUCTS

2841

Stainless-Clad Plates • Manhole Fittings and Covers • Large Diameter Welded Steel Pipe
Flame Cut Steel Plate Shapes • Flanged and Dished Heads

HOW TO BUY V-BELTS

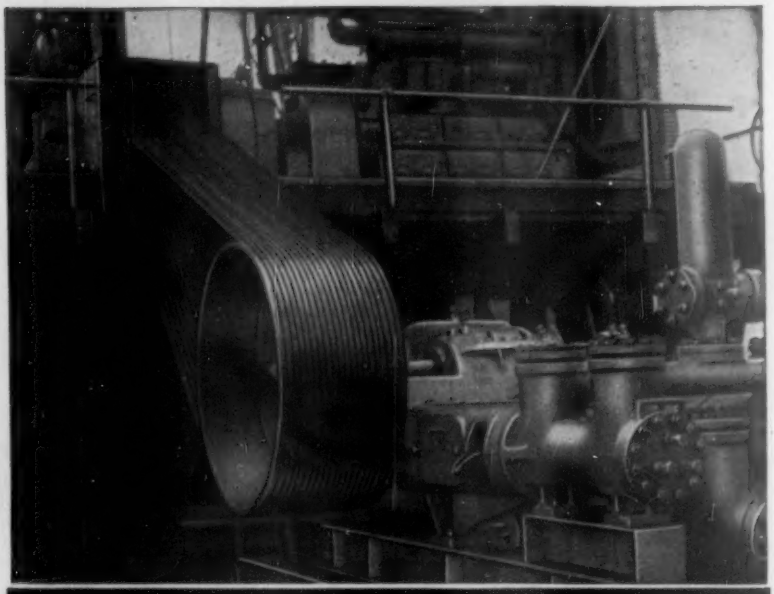
FOR TOUGH, RUGGED DRIVES

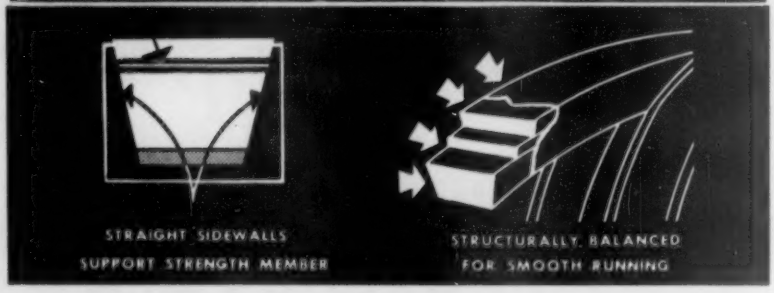
. . . and get

"More Use per Dollar"

Look for a V-belt construction that assures long life under heavy loads, extra strength with the use of the correct strength member.

Higher rig floors and bigger pumps for deeper drilling demand longer, stronger V-belts. Belt strength members of super-strength cords should be correctly positioned in the neutral axis section of the belt so as not to stretch or compress unnecessarily as the other parts of the belt are flexed in use. Straight belt sidewalls help support the strength members in a straight line, permit all cords to pull equally . . . deliver their maximum share of power. The precision balance of *all* parts of the V-belt makes for a smoother running drive, controlled length of every belt in the set, and fewer matching problems . . . longer life with the heaviest power load. Specify by name the V-belt engineered to give you extra strength and extra pulling power for heavy duty drilling operations . . . specify Condor V-Belts.





CONDOR V-BELTS

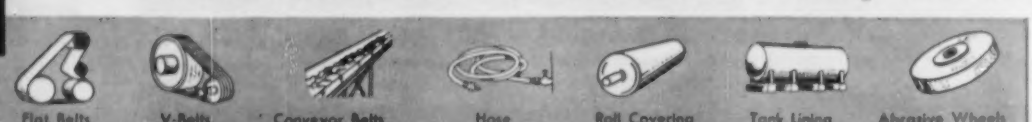
R/M engineers have developed an improved Condor V-Belt especially to meet the demands of high powered deep drilling rotary rigs. The strength members in Condor V-Belts are made of super-strength synthetic cords . . . embedded at the neutral axis in heat dissipating Flexlastics to assure the smooth, internally cool running of every belt despite constant flexing around pulleys. Prestretching during manufacture removes inelastic stretch that might otherwise occur on the job . . . there are no laggards and no over-strained belts. Matching problems are further eliminated by special humidity protection and individual belt length is controlled. Straight rugged sidewalls grip the grooves with positive pressure for maximum power delivery. Heavy duty covers withstand wear and weather . . . protect the heart of the belt against premature failure. The long service life and uniform power delivery of every Condor V-Belt in the set means more productive operation of your rigs at lower costs.

Let an R/M representative show you how Condor V-Belts last longer on the most rugged V-belt drive . . . give you "More Use per Dollar".

RM 512 OF

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings • Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

STATESMEN OF TECHNOLOGY

within the shadows of the ancient Roman Forum an unusual type of diplomacy is at work. Meeting at the Fourth World Petroleum Congress, representatives from many countries have assembled in Rome to discuss mutual problems and to survey the latest developments in the science of petroleum. By this means, the free exchange of ideas and experiences is facilitated among men who are drawn together by the universal desire for progress and success.

And success will be theirs . . . success that will be measured in far greater terms than in the advancement of an industry. For, with their unhampered search for new ideas every member of the Congress becomes a statesman for the free world . . . statesmen of technology . . . and truth.

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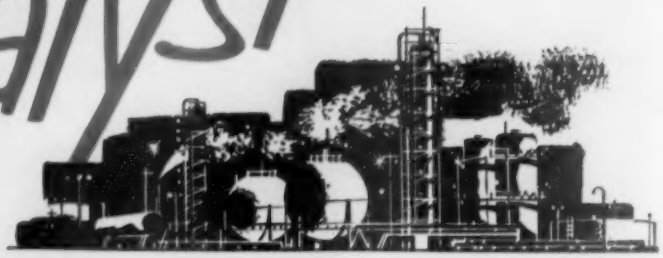
WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM, PETROCHEMICAL, AND CHEMICAL INDUSTRIES

PROCON®

Davison M-S®

HIGH ALUMINA Catalyst



DAVISON GIVES YOU HIGH ALUMINA CATALYST IN THE PARTICLE SIZE BEST SUITED FOR YOUR UNIT!

HIGH ALUMINA M-S CATALYST PARTICLE SIZE DISTRIBUTION

The catalyst with a *minimum of fines* . . .

Grade	F-3-25 Extra Fine	F-2-25 Fine	F-1-25 Inter-mediate	C-1-25 Coarse	C-2-25 Extra Coarse
Size range by C.A.E.: Wt. %					
0-10 Microns	4	2	1	1	1
0-20 Microns	9	4	2	2	2
0-30 Microns	16	11	6	5	4
0-40 Microns	28	21	12	10	8
. . . and a *minimum of coarse particles*					
Sieve analysis: Wt. %					
on 100 mesh (149 microns)	0	0	1	1	1
on 140 mesh (104 microns)	1	1	4	6	8
on 200 mesh (74 microns)	4	5	15	22	33

Now Davison has taken the characteristics of High Alumina Catalyst and combined them with the proven advantages of its 13% Alumina Catalyst. This gives you, for the first time, High (25%) Alumina Catalyst with *all* these qualities:

- ***Lower Stack Losses***
- ***Better Maintenance of Activity and Surface Area***
- ***Narrow Particle Size Distribution***
- ***High Attrition Resistance***
- ***High Purity and Uniformity***

For information on Davison High Alumina Catalyst see your Davison Representative or write.

Progress Through Chemistry

DAVISON CHEMICAL COMPANY

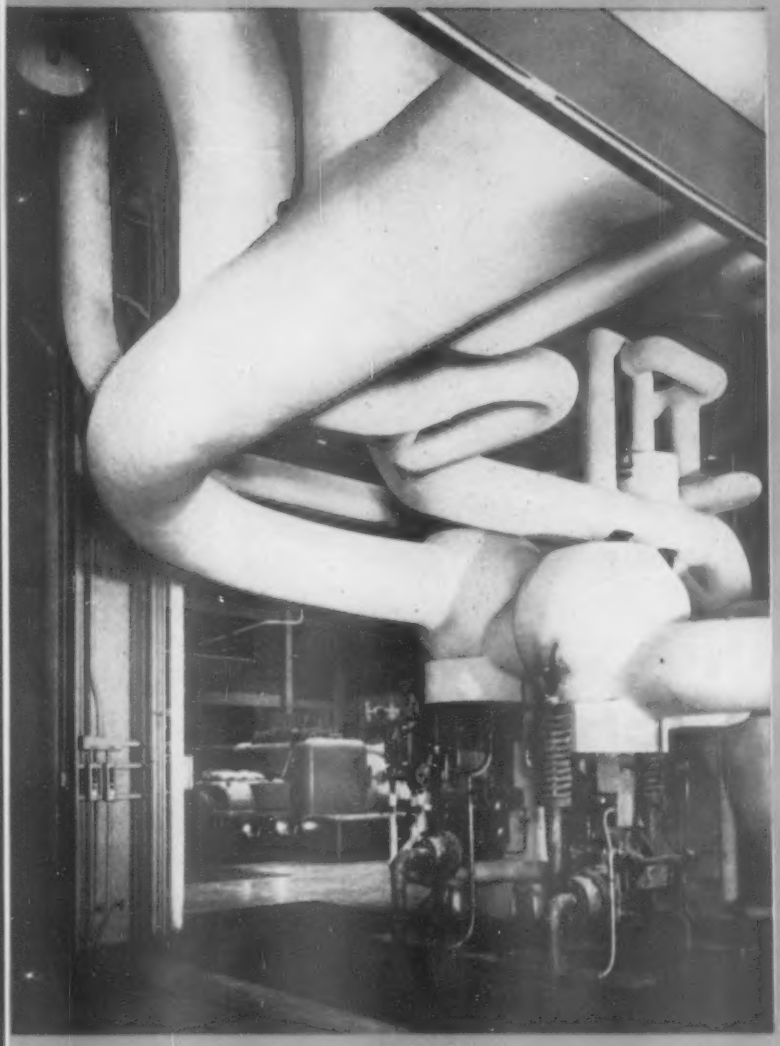
Division of W. R. Grace & Co.

Baltimore 3, Maryland

Sales Offices: Chicago, Ill.; Houston, Tex.; New York, N. Y.; Baltimore, Md.

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, TRIPLE SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS AND SILICOFLUORIDES. SOLE PRODUCERS OF DAVCO® GRANULATED FERTILIZERS.

What do you buy when you place a Piping Contract?



What you really buy is performance . . . and good value for your piping dollar. And how do you get these? By selecting a piping contractor who has a reputation for quality work . . . who is called upon to do job-after-job for the same customers. It's as simple as that.

Midwest is such a piping contractor. Midwest Piping is superior piping and good value for every piping dollar. We shall be happy to have you ask us to prove it.

PIPING FABRICATORS AND CONTRACTORS FOR MORE THAN *50 Years*

MIDWEST PIPING COMPANY, INC.

Main Office, 1450 South Second St., St. Louis 4, Mo.

PLANTS: ST. LOUIS, PASSAIC, LOS ANGELES, and BOSTON

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6492

MIDWEST **PIPING FABRICATION and CONSTRUCTION**

OFFERS YOU MANY BENEFITS

Close to 3 yds. of material in the bucket of this 2¼-yd. MICHIGAN . . .

The bonus in the bucket pays for this machine fast!

Take another look at the bucket in the photograph. It shows a typical MICHIGAN* bucket-load, heaped-up well over the rated capacity of the bucket—nearly a 50% bonus. Translate this bonus into your daily production and you'll see why a MICHIGAN Tractor Shovel pays for itself fast: you simply move more material with a MICHIGAN.

Tremendous digging ability. Get the bucket blade into hard-to-dig material or under a heavy obstacle and "work" the bucket until you've got a heaping load. The two double acting bucket cylinders are actually powerful enough (if the blade is under an immovable object) to pull the back wheels off the ground! We'll match the MICHIGAN'S digging ability against any make or type of Tractor Shovel, bar none.

Low-level bucket action. You can roll the bucket back only a few inches off the ground—heaping bucket-loads even when the material is scattered only a few inches high. And you can carry the full load *low*—your driver can *see* where he's going, he doesn't have to travel *backwards*.

No clutch—faster cycles. There's no clutch pedal on a MICHIGAN. You can actually shift between Forward and Reverse *while moving:* simply push the hand-lever on the steering column—MICHIGAN'S power-shift transmission shifts instantly. Power-shifting saves time and energy every cycle. Your operators will say: "This sure beats riding a heavy-duty clutch all day!"

See it in action—on your own job. Write us and we'll arrange a demonstration. MICHIGANS are built to handle jobs too tough for other rubber-tired Tractor Shovels—*let us prove it*, without obligation. Write for details on the pay-as-you-go MICHIGAN Lease Plan—you can put these machines to work without laying out a penny of capital.

CLARK EQUIPMENT COMPANY
Construction Machinery Division
448 Second Street
Benton Harbor 27, Michigan
Phone WA 6-6184

CLARK EQUIPMENT

*A Trademark of Clark Equipment Company

DOW

...almost out of sight already...

YOUR CAUSTIC ORDER'S ON ITS WAY FROM DOW

The steel rails could be in New York or New Mexico . . . the highway in Oregon or Alabama. Wherever, however . . . it's another caustic soda order on the way from Dow. The order is just hours old, but it's on its way.

Dow's vast and amazingly flexible distribution network is the answer. Three plants and six shipping terminals are tied together by a network of order communications.

Hundreds of caustic customers have learned how resourceful and helpful Dow Technical Service men can be. Whether it's an irritating wrinkle in your processing or a basic decision about the form of caustic you can use to best advantage—a call to Dow brings these trained consultants to you. Surprising savings in plant operations often develop from their visits.

Put your caustic problems "out of sight" for good. Simply make sure your next caustic order is with Dow. THE DOW CHEMICAL COMPANY, Dept. AL 3900, Midland, Michigan.

you can depend on DOW CHEMICALS DOW

The guy on the right is Joe Roughneck. He's the brains and the brawn of the oil industry. Whether he is on a rig in the field or whether he has moved up to be president of his company . . . he knows oil . . . and pipe.

And there's another thing Joe knows . . . that just around the corner is Lone Star, a completely integrated steel mill whose specialty is manufacturing API casing, line pipe and tubing. Top quality . . . quick delivery . . . largest mill stock in the Southwest . . . homefolks . . . it's a natural, as "natural" as six-ace, or five-deuce!

Neighbor, wherever you are, specify Lone Star . . . and we both get a good deal!

Lone Star STEEL COMPANY

LSS

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DISTRICT SALES OFFICES
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Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

They Say—

The Canadian "Mess"

"The future of the trans-Canada gas-line project awaits a promised meeting of the federal government, Premier Manning of Alberta, Trans-Canada Pipe Lines, Ltd., and the Alberta gas producers.

"The company . . . is talking about an exchange with the U.S. It proposes to import U.S. gas in the East to supply Montreal as well as Toronto, and to export Alberta gas in the West to supply the U.S. Midcontinent market. It offers to the U.S. Federal Power Commission not one but two chances to veto the development of Canadian gas reserves. The federal government . . . shows some sign of wavering on this exchange proposition — explaining, of course, that it is only in the interest of an eventual line right across Canada.

"On the West Coast, Canada and Alberta between them have made good their determination that the markets of B.C. and the northwestern states of the U.S. shall be supplied from the Peace River region and not from southern Alberta. But from there on in it is the FPC which has called the tune. It refused the original application of the Westcoast Transmission Co. which would have given the U.S. states concerned their most plentiful, economical, and expansible supply of gas. And it gave the franchise to a U.S. company which could meet neither the quantities nor the economies offered by Canada. . . .

"The humiliating situation in which the Canadian Government now finds itself is the direct result of the Ottawa muddling to which the Post has drawn attention time and again. We haven't got into this situation because competent authority made a bad judgment. We've got into it, essentially, because we never had a competent authority to study the full implications of energy exports and movements. We've followed a hit-and-miss course. We've landed in a dangerous mess."

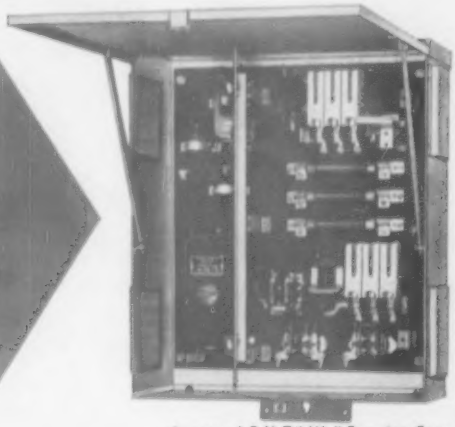
Editorial in Toronto's Financial Post.

More Apprehensive

"Let us never forget that control of energy is the first step toward totalitarianism. We can't have competition as a basis of our economy and regimentation and control at the same time. Now after many weeks in Washington, I can tell you this: My apprehensions have only been increased. I honestly

NOW ANOTHER BIG ADVANTAGE

The oil well pumping control preferred by most users now offers easy in-the-field modification of restarting characteristics



Improved C-H Oil Well Pumping Control permits easy in-the-field modification to the type of restarting desired after power interruptions.

All the features that from the start have made Cutler-Hammer Oil Well Pumping Control the oil country's No. 1 preference have been retained. But now this control has been still further perfected. It may now be modified easily *while in use* to meet changes which occur in field operating conditions. The control panel now readily accepts either a C-H Undervoltage Relay or a C-H Time Delay Relay. Panel space is provided and a diagram inside the cover shows all circuit arrangements with leads numbered to permit easy wiring changes.

Here's how it works. If you are operating just a few wells the basic C-H Pumping Control automatically restarts pump motors just as soon as power is restored. But if you increase the number of wells operating, the combined restarting load of all pumps may become too heavy. Then you add C-H Undervoltage Relay and pumps are restarted manually, one at a time. But if your operations become so extensive as to prohibit manual restarting, you simply change to C-H Time Delay Relay that provides automatic staggered restarting. No need to buy new starters as your needs change. Just the simple, inexpensive addition of one relay or another, in space provided for the change.

This feature is in addition to aluminized enclosure that reflects sun rays and heat; screened and louvered ventilators that shut out dirt and pests; cool, dust-safe vertical contacts; finest program time-switch; full 3-phase overload protection; high torque clock motor; etc., etc., etc. The original oil country pumping control that has no equal. Insist on Cutler-Hammer and refuse all substitutes. CUTLER-HAMMER, Inc., 1453 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

Cutler-Hammer Program Time Switch for scheduling of pumping cycle automatically. Day-omission feature available.

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MOTOR CONTROL
C-H

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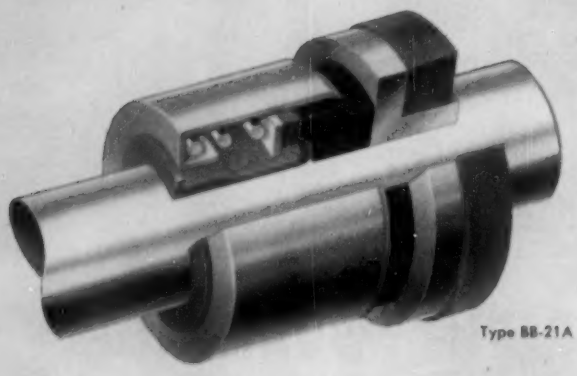
GARLOCK MECHANIPAK SEAL



Type BB-21A

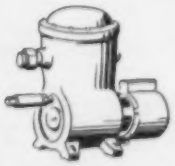
for Rotating Pump Shafts at pressures up to 150 p.s.i.

COMPLETELY ASSEMBLED — READY TO INSTALL

The Garlock BB-21A MECHANIPAK Seal, proven in service on thousands of water pumps, provides a low cost *leakless* seal.

IMPORTANT FEATURES

This MECHANIPAK Seal occupies a very small space—specifically designed for rotary pump shafts. It comes completely assembled, ready to install. Standard construction includes brass shell, brass washer and Buna-N bellows. Other materials available. Furnished for shafts from ⅜" to 3" diameters.



SAVE 3 WAYS

Customers tell us the MECHANIPAK Seal *pays for itself.* (1) Reduces maintenance costs (2) Absolutely no shaft wear (3) Cuts down time.

Get all the facts on this MECHANIPAK Seal. Write today for bulletin AD-150.

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believe that if those who want these controls find it possible to make them stick against all rational argument, then we are really in grave danger. . . ."

John W. Boatwright, Standard Oil Co. (Indiana), in an address in St. Louis before the Division of Marketing, American Petroleum Institute.

Finding the State Line

"As far as the present national administration is concerned, Texas' seaward boundary extends 3 marine leagues, or 10 and a fraction miles, into the gulf.

"Enactment of the tidelands state ownership bill in 1953 left dangling the question whether the Government would recognize Texas' claim to a 10-mile offshore boundary. Louisiana made a similar claim, but on different grounds. Now the Justice Department has petitioned the Supreme Court to hold that Louisiana's boundary extends only 3 miles out. Significantly, the department filed no such suit against Texas, and a spokesman for Atty. Gen. Herbert Brownell said it is not contemplated.

"This means that the Government recognizes the difference of Texas' position. And if the court renders a decree construing Louisiana's boundary to be 3 miles, without similarly defining Texas' seaward limit, it will by clear implication recognize Texas' 10-mile claim. . . ."

Editorial in the Houston Post.

It Could Work Both Ways

"Any agency of the federal Government having jurisdiction over gas production is as obligated to the preservation of the interest of producers as of consumers . . . It does now have under the Natural Gas act as interpreted in the Phillips decision the right and duty to raise inordinately low wellhead prices along with its power to restrict increases. Should it undertake to do something about the seriously inequitable wellhead prices in many areas of Texas . . . the effect would be to increase the wellhead price of natural gas.

"Under the Natural Gas act, the Federal Power Commission is obligated to eliminate discrimination to the extent of its jurisdiction. Were it given control over gas producers, therefore, it would be duty-bound to do something about the vast quantities of Texas gas selling for as little as 2 and 3 cents per M.c.f. for which there is no logical explanation. . . .

"I think there is an almost complete lack of understanding of this point.

"The effect of federal-price control as promulgated by the so-called Phillips decision is not to halt the upward

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THREAD COMPOUND

- *full makeup*
- *easier breakout*
- *cushions stabbing*
- *anti-seize, non-galling*
- *assures perfect seal*
- *will not separate*
- *increases thread life*
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Just point it at the fire . . . and press your thumb! Instantly, Fyr-Fyter's new specially designed nozzle spreads the fire-killing chemical powder in a flat, dense, 10 to 12 foot long, and 60° wide angle stream. This thick, blanket-like stream lays a flat pattern of powder level with the base of the fire. It covers a greater area, provides better heat-shielding for the operator and faster flame smothering action!

It's a rugged, lightweight, all-brass extinguisher that's *always ready for action!* A unique, leak-proof valve positively holds air or nitrogen pressure charge . . . visual gage constantly shows pressure condition. Simplified design and construction makes it easy to inspect, clean and recharge. Except after use, recharging is never necessary . . . only periodic visual inspection is required. A service station air chuck can be used for pressurizing.

For instant, more positive protection against Class B and C fire hazards . . . all flammable liquids, gases and electrical fires . . . use an Underwriters' Laboratories Approved Fyr-Fyter Pressurized Dry Chemical Extinguisher! 10, 20 and 30 lb. models are also available.

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advance of prices paid for newly discovered gas. That is because the FPC can prevent this type of increased cost at the wellhead only by denying the right of a pipeline company to purchase such gas, which action would almost certainly be repudiated by the very consumers it thus would be seeking to protect. Consequently, price regulation as authorized under the Phillips decision is limited at most to preventing increased payments to producers of gas heretofore committed which in large part is seriously under priced both in relation to its realistic competitive value and to comparative prices for newly discovered gas.

"In other words, the consumer would be the certain victim of continued federal controls. He not only would have the supply of his gas seriously jeopardized but would find such control actually had the effect of increasing the extremely low wellhead prices which are inequitable. That would be the natural result of efforts on the part of the FPC to bring equity in the prices paid to all producers . . . Federal control of production cannot halt the advance in cost of newly discovered gas except by denying the right of pipeline companies to take it at all . . ."

A. P. King, Jr., president, Texas Independent Producers and Royalty Owners Association, in testimony presented before the Senate interstate and foreign commerce committee.

LA Mayor Against Control

"I am convinced that the legislation (exempting natural-gas producers from federal control) is essential if the gas consumers in the city which I represent are to be assured of a dependable supply at a price that will continue to be fair . . .

"Federal regulation, in peacetime, of the production price of any commodity is wrong . . .

"Such controls would shrink the total supply of natural gas because it would destroy the incentive which gas producers have found necessary to the continuous exploration and development which must go on to keep supply ahead of demand . . .

"We can understand that producers (in other states) may prefer to market their remaining reserves locally, where they will be free from federal control.

"We can understand why many industries which need a cheap fuel supply may find it advantageous to move to states where their supply of natural gas will not be restricted by federal price fixing.

"Furthermore, if the supply available for interstate markets is reduced, that means that the unit cost of sending the remaining supply into interstate

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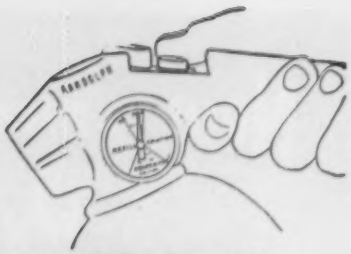
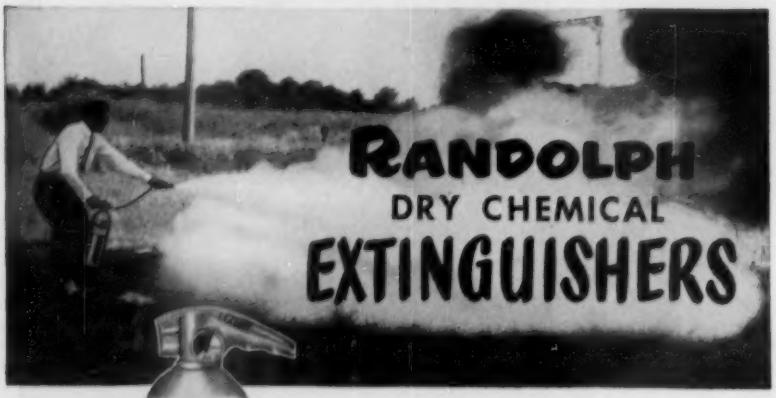
easy thumb action delivers a 500 lb. knockout punch!
. . . at ranges up to 40 feet!





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commerce inevitably will increase. And at least part of the increase will have to be passed on to the consumers of my state . . ."

Mayor Norris Poulson of Los Angeles, in testimony before the Senate interstate and foreign commerce committee.

CALENDER OF EVENTS

JUNE

12-17 Society of Automotive Engineers, golden anniversary summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
16-18 Interstate Oil Compact Commission, Cosmopolitan Hotel, Denver.
17 Northern California Section, American Institute of Chemical Engineers, symposium on waste disposal, University of California, Berkeley, Calif.
20-23 American Society of Mechanical Engineers, semiannual meeting, Statler Hotel, Boston.
23-24 Western Petroleum Refiners Association, technical-industrial relations meeting, Broadview Hotel, Wichita, Kans.
23-26 Rocky Mountain Oil Show, Casper, Wyo.
26-July 1 American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

JULY

20-22 Instituto Tecnologico y de Estudios Superiores de Monterrey, first annual short course on instrumentation for industry, campus, Monterrey, N. L., Mexico.

AUGUST

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting, Hotel Multnomah, Portland, Ore.
15-16 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.
29-31 15th annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

26-Sept. 15 Graduate summer session in reservoir engineering, University of Texas, Austin.

SEPTEMBER

11-13 Independent Natural Gas Association of America, annual meeting, Jasper Park Lodge, Jasper Park, Jasper, Alberta, Canada.
12-14 American Institute of Electrical Engineers, electrical conference of the petroleum industry, Shamrock Hotel, Houston.
12-16 Second International Instrument Congress and Exposition and tenth National Instrument Conference and Exhibit, Shrine Auditorium, Los Angeles.
14-16 National Petroleum Association, 53rd annual meeting, Traymore Hotel, Atlantic City, N. J.
14-17 American Association of Petroleum Geologists, western Canada regional meeting and fifth annual field conference of Alberta Society of Petroleum Geologists, Jasper, Alberta, Canada.
22-23 Western Petroleum Refiners Association, regional technical-industrial rela-

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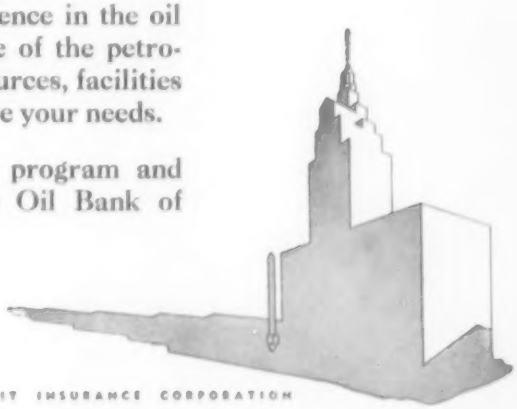
Yes, the Oil Industry has the "go sign" so far as National Bank of Tulsa is concerned.

We have worked with—been a part of—the oil industry from its early days in the Mid-Continent area. We have confidence in the oil fraternity and faith in the future of the petroleum industry. We have the resources, facilities and a wealth of experience to serve your needs.

Submit your oil development program and financial requirements to "The Oil Bank of America."



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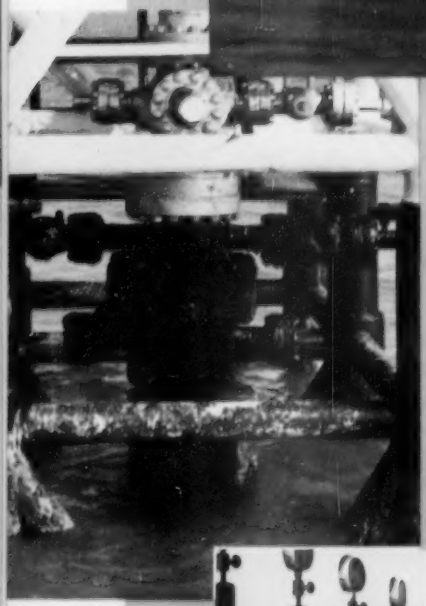
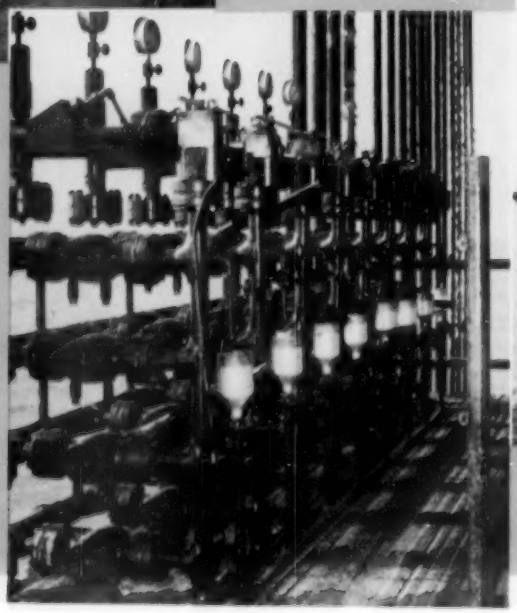
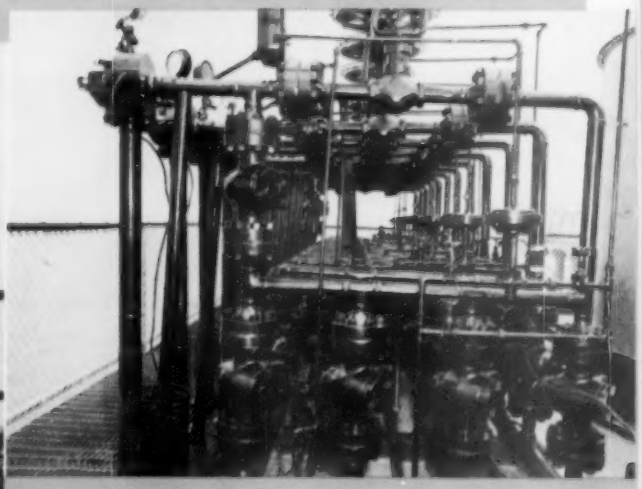


Many of the lessons learned on land are being put into practice at sea by oil operators who are pushing the search miles off-shore. For example, experience has proved that only the very best equipment can meet the working requirements for these remote locations. Operators at sea . . . like operators on land . . . select Mission Plug Valves because they are thoroughly proved under all conditions. In fact, there are almost a hundred Mission Automatic Lubricated Plug Valves in use on this one platform alone.

The Mission Automatic Plug Valve's outstanding features are: (1) a split core that prevents wedging and assures a perfect fit. (2) Two lubricant reservoirs, operated by line pressure, automatically supply lubricant to sealing grooves. (3) Full port lubricant grooves encircle both ports insuring perfect seal and complete lubrication. (4) No lubricant port ever crosses a body port.

Mission Plug Valves, like all other Mission products, carry the famous Mission guarantee and are available through all supply stores.





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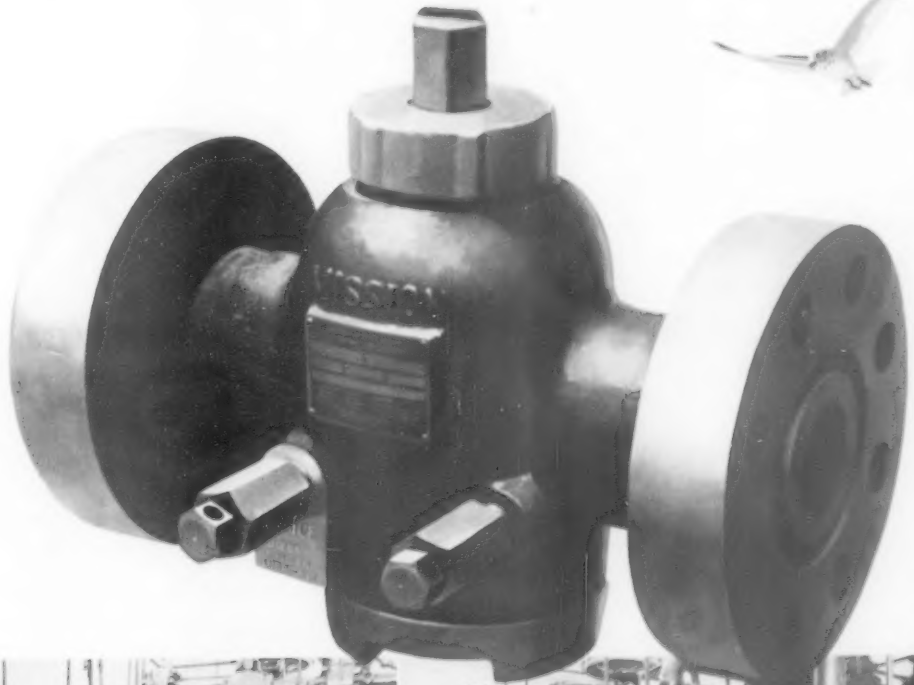

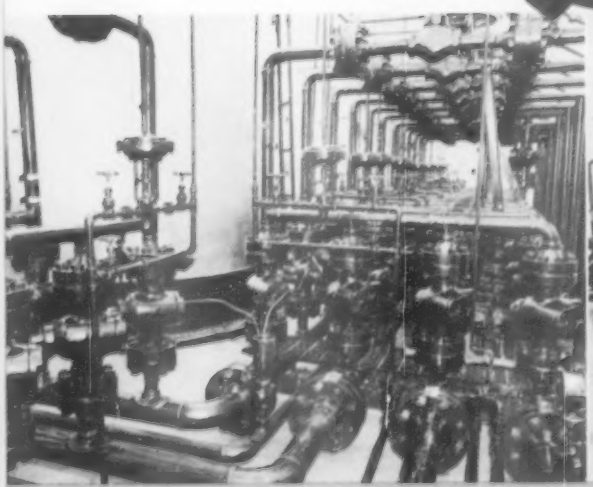

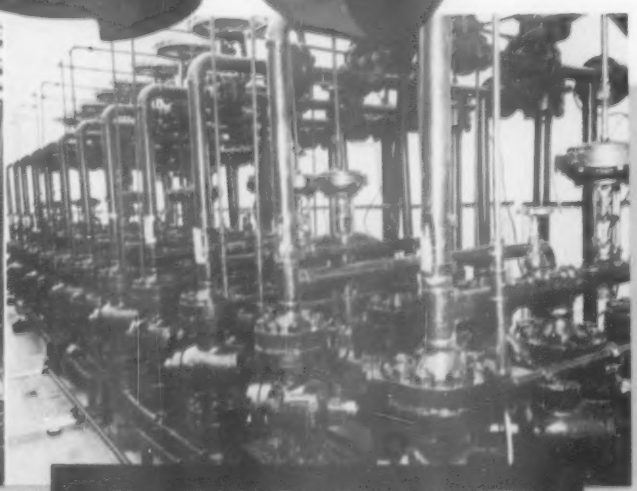

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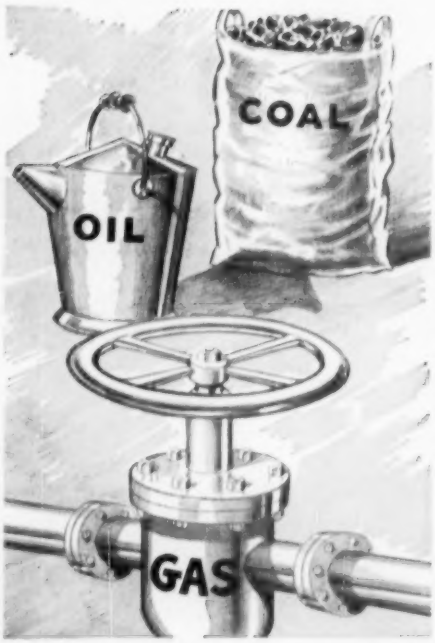

AT THE ends of the gas lines that come out of the Southwest the customer has his choice of fuels—coal, oil or natural gas.

Gas has come along rapidly. In 1932 it provided fuel for less than 10 per cent of the nation's total energy needs; now it fulfills 25 per cent of those needs. Since it is the most convenient of the three, a proper conclusion would be that it would command the highest price.

Contrariwise, it happens to be the cheapest of the three fuels for home heating, on a price adjusted to efficiency basis. A recent study of eight cities, Chicago, Cleveland, Detroit, Minneapolis, New York, Pittsburgh, St. Louis and Washington revealed that gas costs less than the other two fuels in each of these except Washington. It is more expensive than coal in New York, where the comparison was with an especially screened anthracite product rather than bituminous coal. Only the nation's Capitol offers the home owner gas at a price higher than either coal or oil.

In time this may change. What is certain is that the home owner never will pay more for gas than he pays for coal or oil, unless he chooses to do so, since all three are available and he is free to select as his preference dictates.

What is more, should the price of gas get out of line, the home owner has the means of pulling it back by shifting to some other fuel. And this is a quicker and more effective regulation of price than can ever come out of the price-fixing deliberations of any bureau in Washington.

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tions meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana - Arkansas Division, Mid-Continent Oil and Gas Association, annual membership meeting, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

OCTOBER

2-5 American Institute of Mining and Metallurgical Engineers, Petroleum Branch, fall meeting, Roosevelt Hotel, New Orleans.

2-6 American Society for Testing Materials, Committee D-2, petroleum products and lubricants, Statler Hotel, Washington, D. C.

3-4 Texas Mid-Continent Oil and Gas Association, 36th annual meeting, Baker Hotel, Dallas.

3-6 Rocky Mountain Association of Petroleum Geologists and Denver Geophysical Society, 25th annual meeting, Denver.

9-15 American Petroleum Institute, Oil Progress Week.

12-14 National Association of Corrosion Engineers, sixth biennial Permian basin tour, Lincoln Hotel, Odessa, Tex.

12-14 Gulf Coast Association of Geological Societies, annual meeting, Buena Vista Hotel, Biloxi, Miss.

12-14 Gas Appliance Manufacturers Association, El Mirador, Palm Springs, Calif.

13-14 California Natural Gasoline Association, annual fall meeting, Ambassador Hotel, Los Angeles.

17-19 American Gas Association and Pacific Coast Gas Association, annual meeting, Ambassador, Biltmore, and Statler Hotels, Los Angeles.

18-22 National Safety Council, 43rd National Safety Congress and Exposition, Chicago.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Garrett Hotel, El Dorado, Ark.

24-27 National Association of Railroad and Utilities Commissioners, natural gas panel discussion, Asheville, N. C.

27-29 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

31-Nov. 1 Independent Petroleum Association of America, annual meeting, Jefferson Hotel, St. Louis.

31-Nov. 2 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

NOVEMBER

2-4 American Association of Petroleum Geologists, Mid-Continent regional meeting, Skirvin Tower, Oklahoma City.

2-4 Society of Automotive Engineers, diesel engine meeting, Chase Hotel, St. Louis.

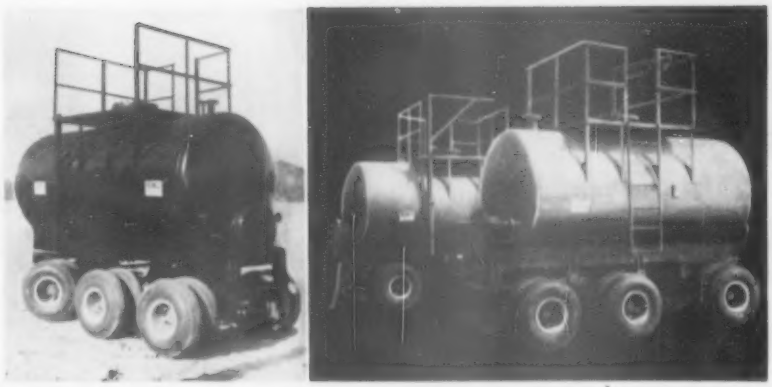
9-10 Society of Automotive Engineers, fuels and lubricants meeting, Bellevue-Stratford Hotel, Philadelphia.

10-11 American Association of Petroleum Geologists, Pacific Section annual convention, Biltmore Hotel, Los Angeles.

13-18 American Society of Mechanical Engineers, 75th anniversary meeting, Hilton and Blackstone Hotels, Chicago.

14-17 American Petroleum Institute, 35th annual meeting, Mark Hopkins, Fairmont, St. Francis and Palace Hotels, San Francisco.

27-30 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Detroit.



Again* Kemco's engineering skill teams up with major refinery *to solve difficult cleaning problems

Kemco was called on to engineer and build these pilot-model mobile tanks for the refinery cleaning program described on page 221. The tank-wagons are of steel or stainless clad, equipped with heating coil and strainer partitions, and have a capacity of 2500 gallons.

Call on our wide experience. Call the man from Kemco.

REFINERY HEAT EXCHANGERS
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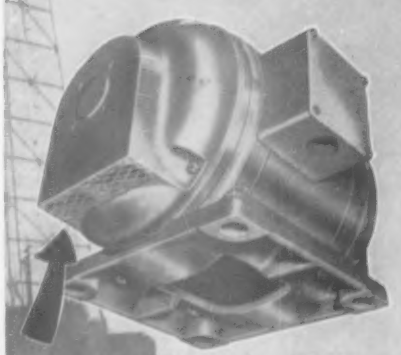
For example — heavy cast base assures alignment stability . . . heavy-duty, double-shielded, pre-lubricated bearings increase performance, reduce lubrication problems . . . high-grade silicon steel in the magnetic circuit reduces iron losses . . . wide variety of windings provides triple ratings, dual voltages . . . high torque licks heavy starting problems . . . high slip is available to take care of reciprocating load requirements encountered in pumping.

The FIELDMASTER has many other **outstanding advantages** that our distributor, the BETHLEHEM SUPPLY COMPANY, will be happy to show you. May we have them contact you . . . **without obligation?**



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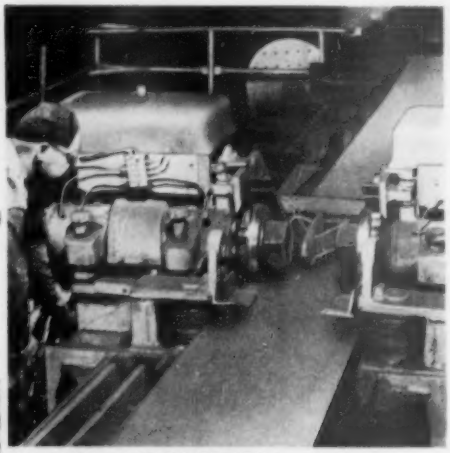

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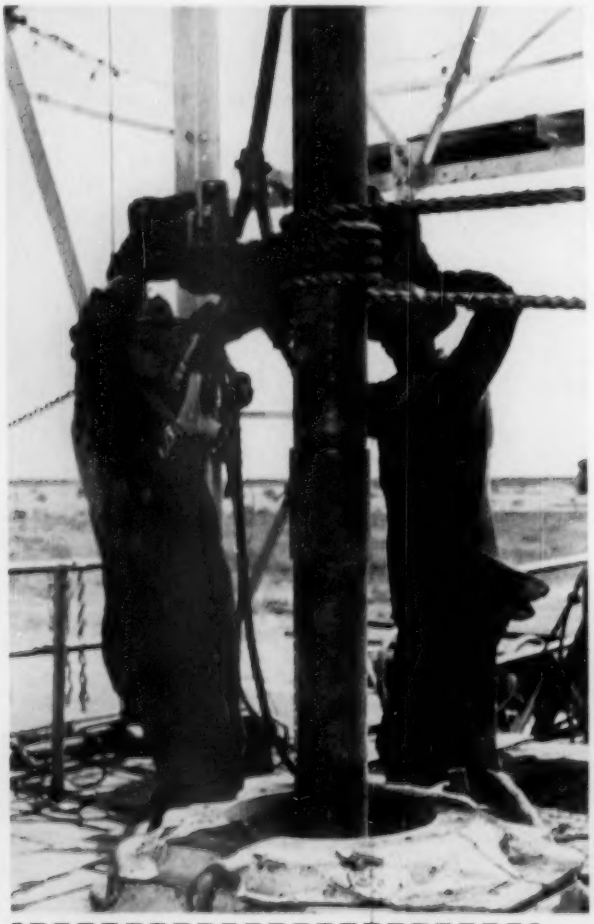

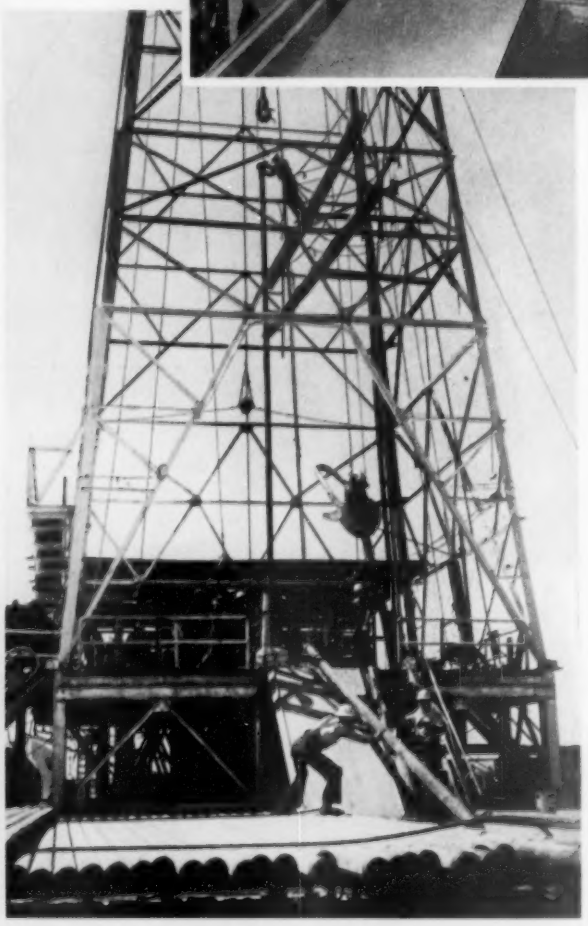

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JOURNALLY SPEAKING...

Texas Today

TODAY the world's biggest magazine salutes the world's biggest oil and gas state—Texas, of course.

This special issue is just all about Texas—that is, it's just all we could get in. Even with as many pages as we have, we couldn't tell all about Texas. But any Texan will be glad to tell you more.

However, there should be enough here to convey the idea that Texas is quite a place for petroleum activity—and enough facts and figures to back up at least some of the things that Texas oil men say about their state.

Texas Tomorrow

OUR own personal assignment for this Texas issue simply read: "Lead piece—six pages." No writer could ask for broader latitude than that, but we did quite a bit of head-scratching over a suitable subject.

Last year we introduced the Texas issue with a thumbnail history of Texas oil, so one of our colleagues helpfully suggested that this year we write about the future of Texas oil.

That seemed like a good idea until we started to do research for our opus. With confident optimism we asked a large number of experts in various phases of Texas oil to predict what things would be like 25 years from now. Without exception they threw up their hands in dismay and refused to go out on any limbs. The stereotyped answer was that they were too busy with the problems of the next 25 minutes to worry about what would happen in 25 years.

But such rebuffs never stump resourceful reporters like us. The truth is that we can write better when not hampered by facts. We set out to make our own predictions. Our first thought was to project and extrapolate statistical, economic, and technological trends, and try to justify our prognostications and explain developments step by step.

But before we had gone far with this, the Voice of Reason said loud and clear: "Henry, you're making an ass of yourself."

So we decided that if we were going to be silly we might as well go all the way and not try to explain or document anything. So we just looked at a blank wall, imagined that we were living in 1980, and started the typewriter going. The result is on page 147.

By using the technique of looking backward from 1980 instead of forward from 1955, we avoid all possibility of criticism. Because, you see, you have to wait until 1980 to prove that we're wrong. So don't throw any bricks until 25 years have elapsed. We won't be here then.

About the illustrations for our fantasy: When our art director, Dud Johnston, discovered what we were writing he grabbed the sheets from our typewriter and rushed to his drawing board. He explained that he is a science-fiction fan and could whip up some futuristic sketches that would make our eyes bug out. But the result looked rather mild compared with our son's space-travel comic books. So we chided Dud a bit, saying that the helicopter, for instance, looked like a mere 1960 model. Dud never batted an eye.

"Did it on purpose," he said. "If I drew pictures of what I think things will be like in 1980, nobody would believe me."

We're glad we weren't held back by any such hampering inhibitions.

Texas Star

TO forestall anticipated complaints from purists and professional Texans, we hasten to admit that we know that the star on the front cover is not the regulation Texas star that appears on the Lone Star flag.

The arc-sided star we used is sometimes known as an orange-peel star because it gives a rounded, or three-dimensional effect. The style of lettering used adds to this illusion. This makes it look as though the star had been carved out of a globe, or is prepared to wrap around a sphere. This should give Texans the feeling that their star is the major part of this terrestrial sphere, or is about to encompass the globe. That explanation ought to assuage offended Texas pride.

There is also another explanation: Our artist said he made the star fat in order to get in all the lettering.

—*Henry D. Ralph.*

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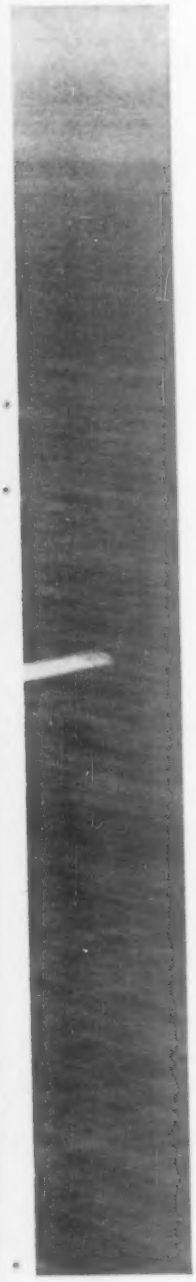

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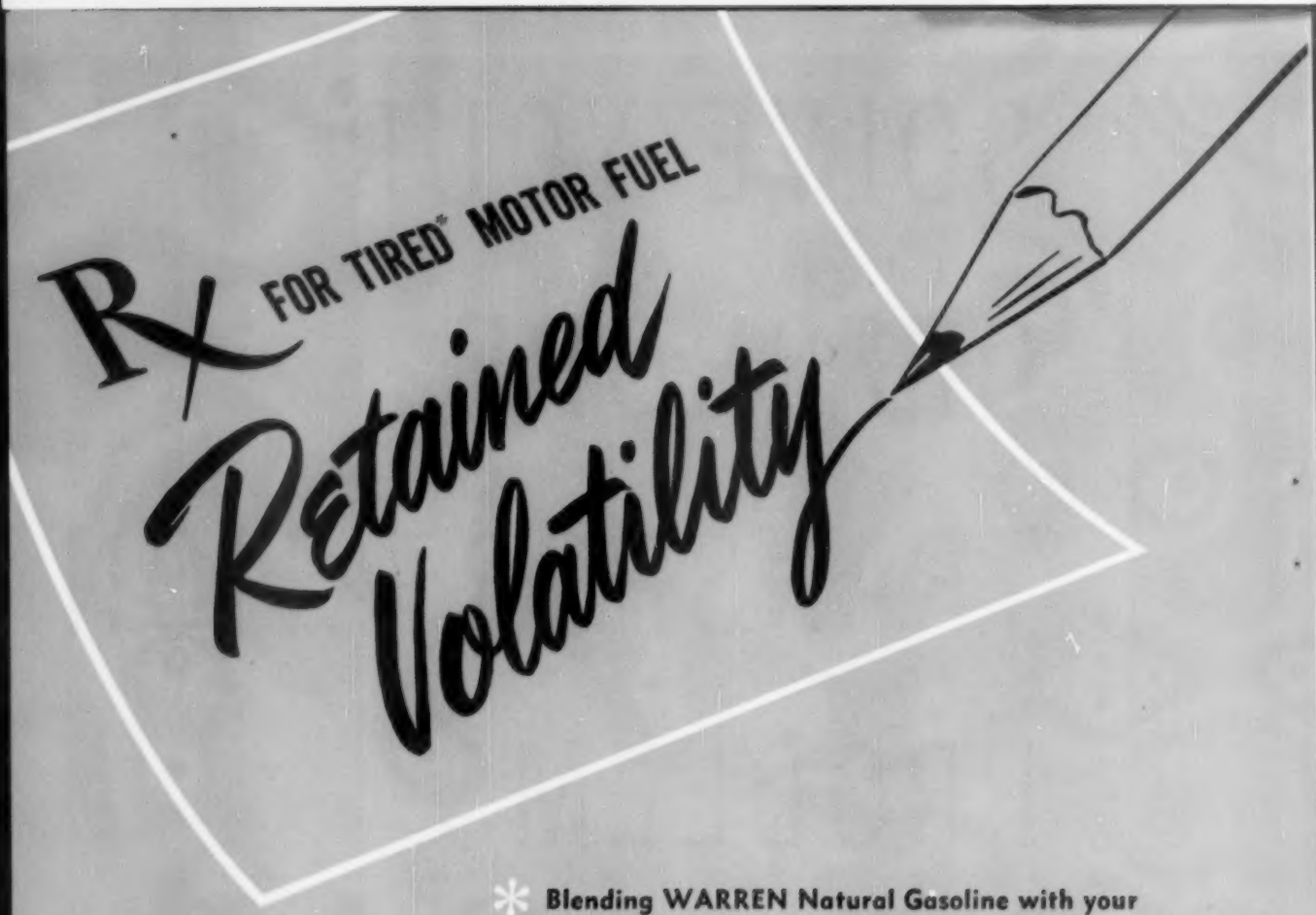

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Texas today is building for its industry tomorrow

TEXAS today is unquestionably the biggest oil and gas state any way you measure it. This is due partly to its mere size, partly to its geology and its location with respect to markets, and partly to its regulation and taxation policies.

But Texas today is facing stiffer competition than at any time in its oil history. Its market for crude is being squeezed on the one side by imports of foreign oil and on the other side by production from states which pay less attention to keeping supply in balance with market demand.

Texas has assumed the responsibilities of leadership in the industry which its size has imposed on it, and for the most part it has carried its responsibilities well. Long a believer in conservation and proration, Texas has valiantly curtailed output with less assistance than it should have had from other sources of supply.

THIS CURTAILMENT HAS CAUSED SOME OPERATORS —fortunately only a relative few—to turn their backs on Texas and seek greener pastures where crude is temporarily cheaper or where producing practices are less restrictive. But the Texas regulatory authorities are not much worried about this. They feel that most of these dissidents will return to the Texas fold in due time.

This is based on the firm conviction that a sound petroleum industry must have stability which permits long-range planning and financing. It must also have assurance that production will be sustained for a long period in an orderly manner aimed at maximum ultimate recovery.

Conservation and proration as practiced in Texas bring these results. There is room for improvement in some of the state's laws and regulations, but many years from now Texas will be reaping the benefits of its general adherence to the fundamentals of a sound industry.

TEXAS COULD OUT-COMPETE most other states and probably some foreign nations if it cared to open production wide and fight for markets in a knock-down price war. There are temptations to do this in periods of general oversupply of crude and when competing suppliers are disregarding the rules of the game.

But Texas is big enough not to yield to this temptation—big enough in the sense of having the wisdom, courage, and strength to stick to its guns even at the cost of some temporary loss of markets.

In addition to the gratitude of the industry for its stabilizing influence, the payoff for Texas will come in future years when its carefully husbanded resources are eagerly sought by a greatly expanded market.

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services for the oil industry

DOWELL

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THIS WEEK . . . . . IN THE NEWS

International

• The political climate in Sicily appears to be favorable for continued oil development by private companies. Sicilian voters last week rejected left-wing proposals to nationalize the oil industry.

• Prospects for private-company operations in Argentina and Guatemala also seem a little brighter. In Argentina, President Peron has urged approval of an exploration concession for Standard of California. The Guatemalan Government, meanwhile, is revising an earlier draft of its proposed petroleum law. The revision is expected to improve conditions for foreign operators.

• Politics affecting the oil industry will leave some questions to be answered in India and Brazil. A constitutional amendment backed by the Indian Government has been interpreted as a threat to future operations by private oil companies. And in Brazil, there is a new clamor for opening exploration to foreign firms.

Natural Gas

• A big fight is expected to develop on the floor of the House over the Harris bill. The bill squeezed through the House interstate commerce committee last week by a 16 to 15 vote after it was rewritten. Foes predict the bill will not make it through the House without some broad amendments.

Production

• The Texas Railroad Commission is expected to give early approval to a plan to unitize and conduct a pressure-maintenance program in Cogdell field in Kent and Scurry counties, West Texas. The new unit will be the fifth pressure-maintenance project in the area's prolific Canyon Reef pay. Ultimate recovery at Cogdell is expected to hit 60 million barrels as result of the program.

Pipelines

• Texas Eastern has revised its plans to move products to the East Coast. The new proposal includes conversion of the Little Inch from natural gas to products, but also calls for standby pumping and compression capacity along both the Little and Big Inch to handle more gas and products in case of an emergency.

• Three Rocky Mountain pipeline projects are swinging into high gear. Pipe is rolling out of the mill at a 3-miles-a-day rate for the Pacific Northwest's big-inch gas line. Colorado Interstate has started work on its Denver area project, and Butte Pipe Line has awarded contracts for its crude line from the Williston basin.

• Westcoast Transmission has been granted an extension for its line. The permit gives the Canadian firm until 1957 to complete the carrier from the Peace River area.

Exploration

• Companies may be moving into Alaska before too long. The Interior Department is again pushing a program to open 20 million acres of Alaskan lands to exploration and development. The proposal is before the House and Senate armed forces and interior affairs committees.

• California Gov. Goodwin Knight is expected to sign a measure opening new areas off California's coast to exploration. The assembly made a few changes last week before passing the bill and sending it to Knight to sign into law.

Industry

• Engineers and technical workers are the target of a new labor-union campaign in the Gulf Coast oil and chemical industry. The American Federation of Technical Engineers, an A.F.L. affiliate, has made its first pitch to join by letters. Union organizers will follow up later with personal contacts.

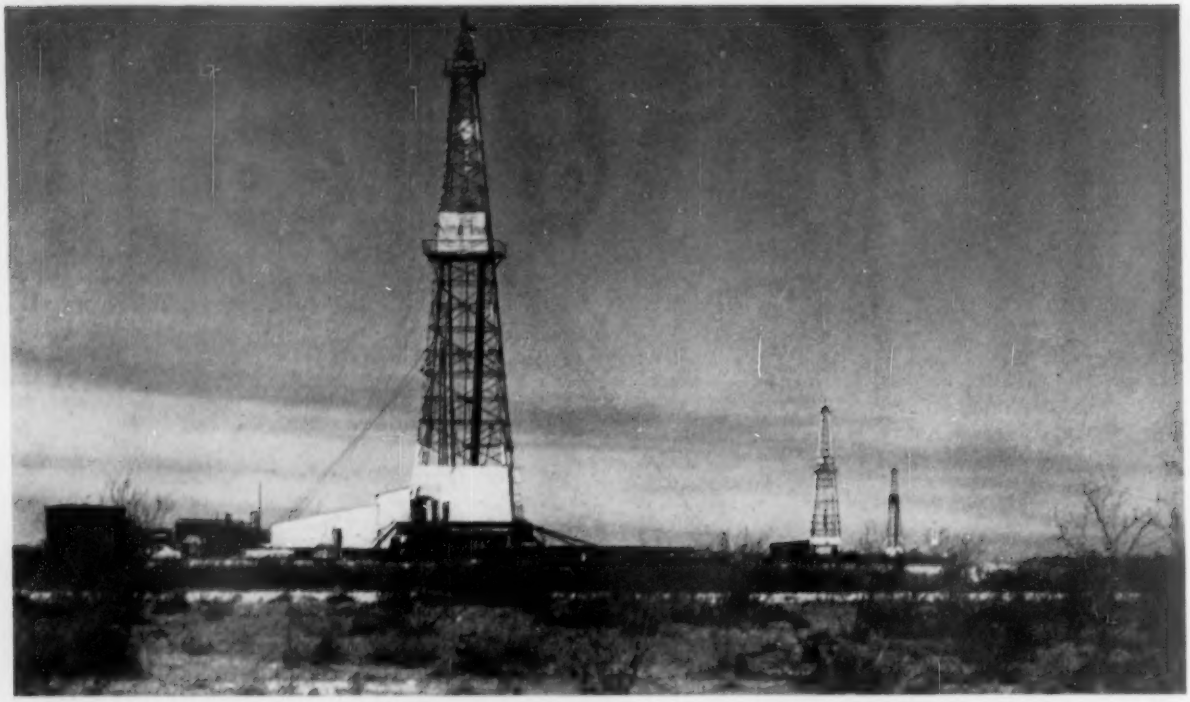
• Tennessee Gas Transmission Co. has suddenly become a fully integrated oil operator. In a $19 million deal it has acquired two refineries and oil production property of Bay Petroleum.

• The low birth rate of the nation's depression years is beginning to be felt by the oil industry in a shortage of scientifically-trained personnel. It is expected to get worse for the next 5 years.

Refining

• The fully automatic refinery is on its way, but it won't be an overnight development. Paul Condit, Houston engineering specialist, told the Texas A.&I. College Short Course on Gas Technology the development is to be slow, and guided by progress first made in the research lab.

• Gulf Oil Corp. is falling in line with the trend toward more hydrogen-treating by taking the wraps off its new hydrogenation process, "Gulfining." Gulf will build two 20,000-bbl. Gulfiners at Port Arthur. M. W. Kellogg has received the contract.



YOU DON'T SEE sights like this in Spraberry any more. Drilling on 40-acre spacing is long gone. There's a good chance 80-acre drilling wouldn't pay out now. This picture was made when Spraberry was the hottest area in the country.

1955—Year of Decision in Spraberry

- **Lease allowables, higher gas-oil ratios are proposed; but these wouldn't begin to solve field's basic problem**
- **Right now there's too little oil, too much gas; without a new recovery method, many acres will remain undrilled**

Robert J. Enright

DALLAS.—This looks like a year of crisis for the sprawling Spraberry Trend Area field.

Oil production is falling. Gas-oil ratios are soaring. Most gasoline plant operators are complaining they can't handle any more gas.

It's becoming obvious that many wells will never pay out, that what once looked like a bonanza will be the graveyard of a lot of oil-industry capital.

Two proposals are being considered which could influence the outlook:

. . . Lease allowables, instead of well allowables, last week were proposed to the Railroad Commission by Phillips Petroleum Co.

. . . And doubling of gas-oil ratios without penalty also was asked.

But these plans, even if approved, would mean only short-term benefit. It looks as if the field, for some time to come, will justify its unhappy title: The world's largest reserve of unrecoverable oil.

What's involved . . . Spraberry Trend Area takes in roughly 400,000 acres in Midland, Glasscock, Upton, Reagan, and Martin counties in West Texas. There are about 2,400 wells in the field and room for a great many more if proved acreage were completely drilled.

On March 1 the field had produced 87,000,000 bbl. of oil. This looks good because it is a whale of a lot of oil.

It isn't good, though, on a per-acre or per-well basis. It's definitely bad. Spraberry, for the most part, is producing less than 1,000 bbl. per acre and less than 40,000 bbl. per 40-acre well. How much less varies. One large firm says its recoveries are closer to 600 bbl. per acre and 24,000 bbl. per well. One of the biggest in the field has said its survey of 30,000 Spraberry acres showed only 380 bbl. per acre and about 15,000 bbl. per well.

Spraberry wells cost roughly from $85,000 to $125,000.

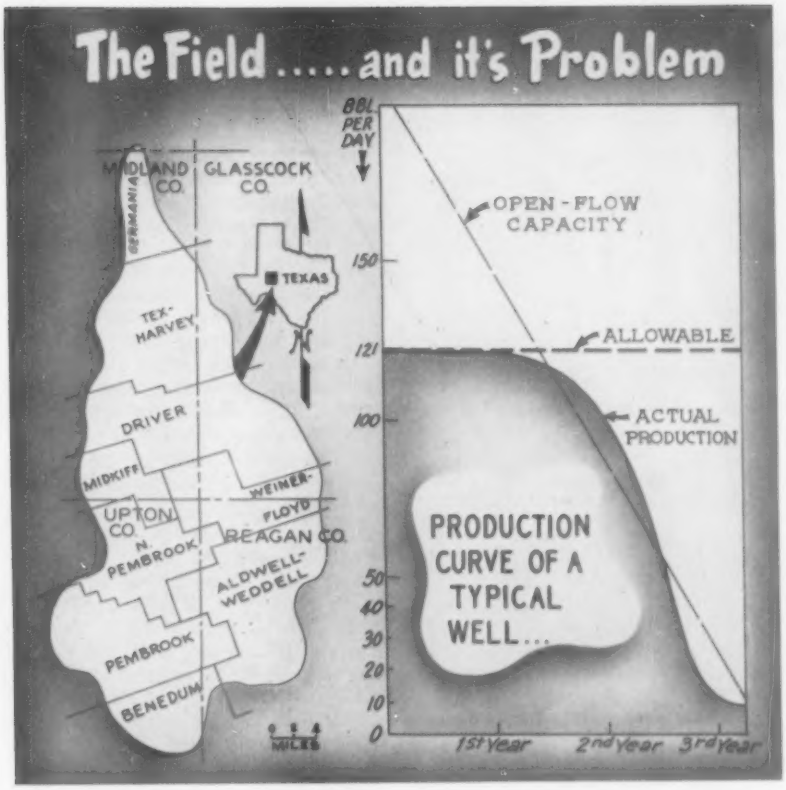
From these figures it's readily apparent that operators will be lucky to get their money back. For instance if a well on 40 acres produces 30,000 bbl. of oil, it will gross roughly $87,000. That's only $2,000 more than it cost to drill the well, not even considering costs of setting up tankage, etc., and operating expenses.

Operators all agree now that, though Spraberry's total oil reserve is tremendous, there just isn't much there per acre. What is there is hard to get out because of the extremely tight nature of the Spraberry sand—just about like siltstone.

Gas-oil ratios are soaring far above the statewide limit of 2,000 cu. ft. of gas per barrel of oil produced. Many wells are listed as marginal producers even though none is more than 6 years old and few more than 3 or 4. Some wells are producing at gas-oil ratios of more than 100,000:1. A growing number are being plugged as production ceases or reaches the economic limit. Very few can make their allowables.

Spraberry definitely is on the wane. Monthly production immediately after consolidation of the field early in 1953 was 2,756,717 bbl. In February of 1954 it had fallen to 2,059,598 bbl. Output sank still further in February of this year to 1,717,927 bbl.

Huge disappointment . . . All in all,



Spraberry today is a far cry from what many predicted it would be 4 or 5 years ago.

Some brashly forecast that Spraberry would produce more oil than any field on the North American Continent.

A drilling campaign which was to develop into probably the biggest single drilling boom in United States oil history resulted when Tex Harvey Oil Co. discovered Spraberry production in 1949.

The rush to get in on the ground floor got frantic in 1950 and 1951. There seemingly was no end to the Spraberry pay. Bankers, car dealers, and others bought rigs and joined the drilling stampede. They created a nationwide surplus of rigs which today is still plaguing the contract-drilling industry.

Spraberry wells were coming in with potentials of 200 to well over 1,000 bbl. a day. By 1952 the play extended more than 50 miles from the Benedum area to the south to the Germania region to the north.

The turning point . . . The crowd of rotaries continued to push down Spraberry holes at a terrific pace until well into 1952.

By that time sobering production reports had begun to come in from the first wells drilled. These reports showed that wells drilled on the 40-acre spacing pattern were producing their allowables for 1½ to 2 years. During the next 12 months, however, production plunged as much as 92 per cent

Operators became more cautious, but for many it was too late. They were already in too deep.

They found that newer Spraberry wells, for instance, had less chance of paying out than the older ones due to drainage of oil by older producers. One firm determined that oil had been drained from a lease by wells more than a mile away.

During the past couple of years, drilling activity in the Spraberry has been comparatively very slow. Acreage proved for Spraberry production remains proved but not drilled. It may never be drilled.

The Spraberry problems . . . Spraberry Trend Area field is a solution-gas reservoir. This is the poorest form of natural reservoir energy. Such a pool produces less of its oil in place than one producing under a gas-cap drive, and still less than one with a natural water drive.

A solution-gas drive characteristically produces considerable gas along with the oil. Spraberry is no exception.

Early in 1953, tremendous volumes of gas were being flared for lack of adequate gathering and processing facilities.

The Texas Railroad Commission became increasingly concerned and in March of that year ordered production over the entire trend shut in until all gas could be handled.

The order later was modified to permit a few operators who were conserving all gas to continue production, but the great majority of Spraberry wells were off production until the first of 1954. By then, Permian Basin Pipe Line Co. had rushed a 30-in. gas-transmission line to completion through the heart of the field, and gasoline-plant operators working on an emergency basis had managed to hook up all producing wells.

The year 1953 was a year of crisis. Along with the casing-head gas problem, operators had convincing evidence that Spraberry wells on 40 acres in most cases wouldn't pay out. They also had proof that a well drilled on an 80 or 160-acre pattern could drain the Spraberry sand of almost as much oil as could two or four wells on a 40-acre pattern. They convinced the Railroad Commission of this at a series of hearings ending early in 1953.

Added income from conserved casing-head gas, 80 and 160-acre spacing, and a hike in the price of crude oil which came along about mid-year in 1953 lifted Spraberry prospects from blackly desperate to just bad. Artificial fracturing, especially the fairly recent high-velocity frac treatments, helped a little more.

But even these techniques can't recover oil that isn't there. One company told the Journal that if a nearly depleted Spraberry well had produced 30,000 bbl. of oil, a high-velocity frac treatment might double well recovery. The company found, however, that added recovery would be far less in a well which had produced say 40,000 or 45,000 bbl. before the frac job.

New crisis . . . As 1953 was a year of crisis for Spraberry, so it appears is 1955.

Oil production is dropping fast in the field now, and gas production is climbing just as fast or faster.

Gas-oil ratios are shooting up all over the field and currently are believed to average somewhere between 6,000 and 7,000:1. In the older Tex Harvey portion of the field, the average for the area is over 10,000:1. (See Table 1.)

Three of the five gasoline plants processing Spraberry Trend Area gas are already at the gasket-popping stage trying to handle all gas produced from wells connected to their gathering systems (see Table 2). All three are operating at or over design capacity. There are rumors that some gas is again being flared in these areas.

The gas-oil ratio in the field offi-

How Spraberry Wells Look in 1955*

Area—	Average per well production (bbl. per day)	Average weighted GOR (cu. ft. per bbl.)	Average cumulative recovery (bbl. per well)
Tex Harvey	11.5	10,807	29,098
Driver	21.0	8,725	36,592
Weiner-Floyd	37.0	6,423	44,436
Midkiff	13.1	6,236	30,987
North Pembrook	25.3	5,901	36,710
Germania	15.7	5,314	33,132
Pembrook	23.0	4,214	32,019
Aldwell-Weddell	59.8	2,867	34,617

*All figures compiled by Phillips Petroleum Co. from data supplied the Texas Railroad Commission by producers and gasoline-plant operators for February 1955.

Capacity and Current Intake of Spraberry Gasoline Plants

Operator—Name of plant—	Design capacity in cu. ft.	Present gas intake in cu. ft.	Load factor (per cent)
El Paso Natural Gas Co.—Midkiff	168,000,000	170,000,000	100+
Pecos Co.—Midland (formerly Tex Harvey)	32,000,000	32,000,000	100
Texas Gas Products Co.—Benedum*	64,000,000	68,000,000	100+
Phillips Petroleum Co.—Spraberry	76,000,000	47,000,000	62
Phillips Petroleum Co.—Pembrook and Benedum	67,000,000	62,000,000	92

*Remote absorbers in Pembrook and Weiner-Floyd areas.

cially still is 2,000:1. If high-ratio Spraberry wells are penalized on this basis, it will mean a big cut in allowable oil production. A 50-bbl. daily well might well be cut to 20 bbl. Such a penalty and resulting production drop, some operators say, would force them to abandon Spraberry wells with considerable producible oil left in the ground.

Usually, gas-oil ratios in a solution-gas drive reservoir can be controlled and oil production increased by injecting gas or water to maintain bottom-hole pressure. Here again, Spraberry isn't typical.

The tight producing pay defies conventional methods of maintaining pressure. No new method has as yet been discovered to increase Spraberry recovery spectacularly. Atlantic Refining Co. has for several years experimented in cooperation with other firms with water imbibition in the Driver area.

It is convinced that it has recovered oil that otherwise could not have been produced. Just how much is debatable. The Atlantic project continued to function when surrounding wells were idle during the 1953 shutdown, and some companies think this may have influenced results.

In any case, operators are reluctant to send good money after bad unless they can be reasonably sure that prospects are good for economic increases in recovery. Phillips Petroleum Co. recently launched an L.P.G. injection project on one of its Spraberry leases, but some time will have to elapse before this one can be evaluated.

Commission tolerant . . . The Texas Railroad Commission, to the present at least, has been tolerant of the spiraling gas-oil ratios in Spraberry. This is believed due to two conditions:

. . . There appears to be no feasible way so far to maintain Spraberry pressure.

. . . All, or essentially all, casing-head gas is being conserved.

Several operators say that sale of their growing Spraberry casing-head output is all that's keeping them going—that it's currently more than meeting operating costs.

A number of them also contend that it would make no difference whether all Spraberry wells were flowed wide open or choked back, that either way they'd produce the same total volumes of oil and gas.

If these things are so, then it might be reasoned that the gas-oil ratio limit should be raised substantially, thus permitting the operators to keep on producing where in some instances they might otherwise be forced to plug.

Though the commission hasn't seen fit to enforce the 2:000 to 1 ratio as yet, Spraberry operators are nervous about what that body may do next month when it sees results of the April-May-June gas-oil ratio survey in the field.

Back in January, Gordon P. Street and Southland Royalty Co., supported by Phillips, asked the commission to declare an 80,000-acre chunk of the field to be an associated gas cap. This section is east of the gas-oil contact at 4,472 ft. subsea.

Production in this area, the applicants said, was only 4 to 5 bbl. per well per day, and gas-oil ratios ranged up to 38,000:1. Although the concerned area is considered fairly well proved for Spraberry production, there are only eight completed wells due to poor pay-out prospects.

This application was opposed by several other operators and was eventually turned down by the commission. One of the opposing operators testified at that time, however, that the commission was faced with either raising gas-oil ratios or whacking allowables.

New proposal . . . On June 3, Phillips came back to the commission with a different proposition, this one concerning the entire trend area.

It came armed with a pile of statistics and two sets of proposed new field rules. Either of the two optional sets of rules, the company said, would:

. . . Raise to 4,000:1 the field's present gas-oil ratio limit of 2,000:1.

. . . Exempt low-capacity wells from shut-down days. By low-capacity wells, Phillips meant any wells not capable of making their allowables—virtually all wells in the field, in other words.

Phillips, with two gasoline plants and more than 200 wells in the field, has a big stake in what happens there. Company representatives at the Austin hearing frankly told the commission's chief engineer Arthur Barbeck that Phillips was worried about what the commission might do when the Spraberry gas-oil ratio survey now under way is completed.

That a lot of other Spraberry operators were concerned too, one way or the other, was evident. The commission had to move the hearing from the commission offices to the ballroom of the Commodore Perry Hotel in Austin to take care of the crowd.

Phillips told the commission that the present field rules, if enforced, would work a severe hardship on Spraberry operators and cause waste through premature abandonment of producing wells.

The company brought along figures (see table) it had compiled on per-well daily production, average weighted gas-oil ratios, and cumulative recovery per well for all eight areas in the Spraberry.

These showed a per-well average daily production of 11½ bbl. of oil a day, an average gas-oil ratio of 10,807:1, and a cumulative per well recovery of 29,098 bbl. for the Tex Harvey area—the field's poorest.

Phillips said present low production plus the fact that 22 per cent of Tex Harvey area wells had been plugged shows that this area is in an advanced stage of depletion. The other areas, excepting Weiner-Floyd and Aldwell-Weddell, it said, are not much better off.

Phillips said 10 to 15 per cent of its own flowing wells could not be pro-

duced economically if penalized on a 2,000:1 basis and subjected to shut-down days. This figure, the company said, did not include wells on artificial lift. It has 15 wells which it has to swab periodically to keep flowing. The company said it hasn't put these wells on the pump because it can't justify it economically.

Most Spraberry wells, Phillips contended, are now being produced at capacity regardless of gas-oil ratios. The company argued that it certainly couldn't continue to produce the 15 wells now requiring swabbing if the present 2,000:1 raito is enforced.

The company exhibited results of tests of Tex Harvey wells which it said it had run on a long-term basis in 1954 to see what varying flow rates would do to gas-oil ratios. It said these tests showed that gas-oil ratios decreased when flow rates were hiked. Thus, it said, a raise in the permissible gas-oil ratio limit to 4,000:1 would actually aid oil recovery. Phillips added that it felt that the Tex Harvey wells were comparable to other wells.

A Phillips gas-department official testified that enforcement of the present 2,000:1 ratio would cut gas production of the field around 35 per cent. Some other firms felt the cut might be closer to 50 per cent.

Since production now is at capacity in most cases and gas-oil ratios are already higher than 4,000:1 in all but one area of the field, the official said, field gas production actually would drop 10 to 15 per cent if a 4,000:1 ratio is permitted and enforced.

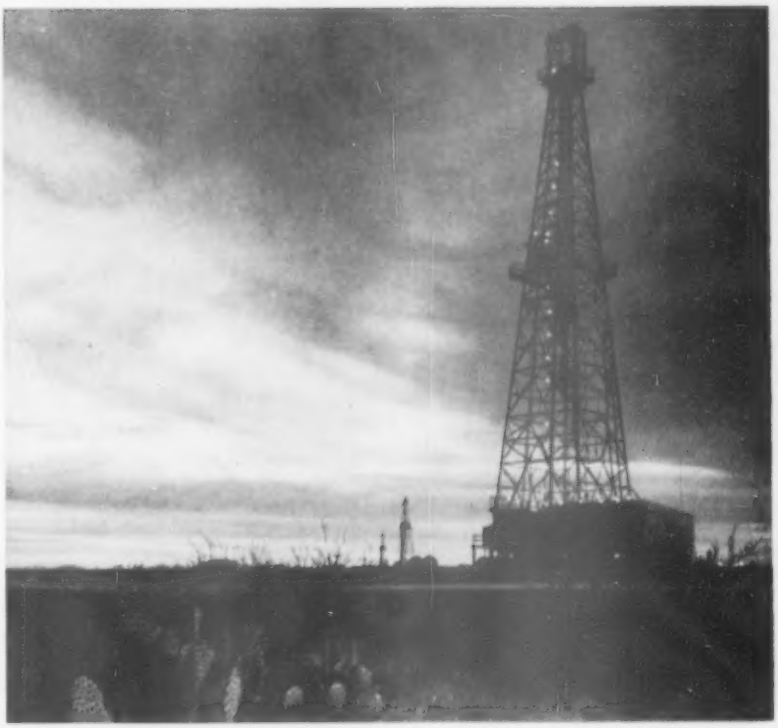
Cool reception . . . In addition to the 4,000:1 ratio, Phillips proposed that gas-oil ratios and daily oil allowables be calculated on a lease basis and that lease gas limits replace individual well gas limits.

Most operators attending the hearing agreed that the 2,000:1 ratio limit should be raised. The provisions for lease oil allowables, gas-oil ratios, and gas limits, however, raised quite a storm.

The Texas Co. stated strongly that it will oppose any provision to measure gas-oil ratios on a lease basis. Other operators objected just as vehemently to lease oil allowables as well. Humble Oil & Refining Co. and Stanolind Oil & Gas Co. were among them.

Arguments were that such rules would permit violation of correlative rights and allow an operator with a virtually depleted lease to drain oil and gas from a better adjacent lease.

Others argued that the effect of the Phillips rules would be to give free rein to producers with marginal and limited capacity wells, while penalizing those with the best wells in the field.



BIGGEST OIL RESERVE in North America was the tag given Spraberry by some in the boom days of 1950-52. By the time production began to dip, many small operators and some big ones already were hurt.

Plant operators concerned . . . Producers aren't the only ones concerned about Spraberry. Gasoline-plant operators and the pipelines handling Spraberry residue gas turned out in force for the hearing too.

El Paso Natural Gas Co.'s A. L. Hill said his firm was processing absolutely all the gas its Midkiff plant could take. He warned against any commission action in the Spraberry which would increase gas production in the area served by the El Paso plant.

Hill said he wasn't at all sure that an enforced 4,000:1 ratio would decrease Spraberry gas production as Phillips representatives had argued. The commission, he said should wait to rule on the proposals until it and others have had sufficient time to study what would happen if the rules were adopted.

Representatives from Texas Gas Products Co. and Pecos Co. said their plants also were running at or over design capacity and could not take more gas.

All three said they could not economically justify expansion of their plants to handle more gas due to the expected short life of the gas source. Hill set this at 7 to 8 years.

Phillips testified that its Spraberry plant was running at only 62 per cent of capacity and that its Pembrook and Benedum plants farther south were processing at 92 per cent of capacity. The company asked if some of the surplus gas could be diverted to the Phillips installations.

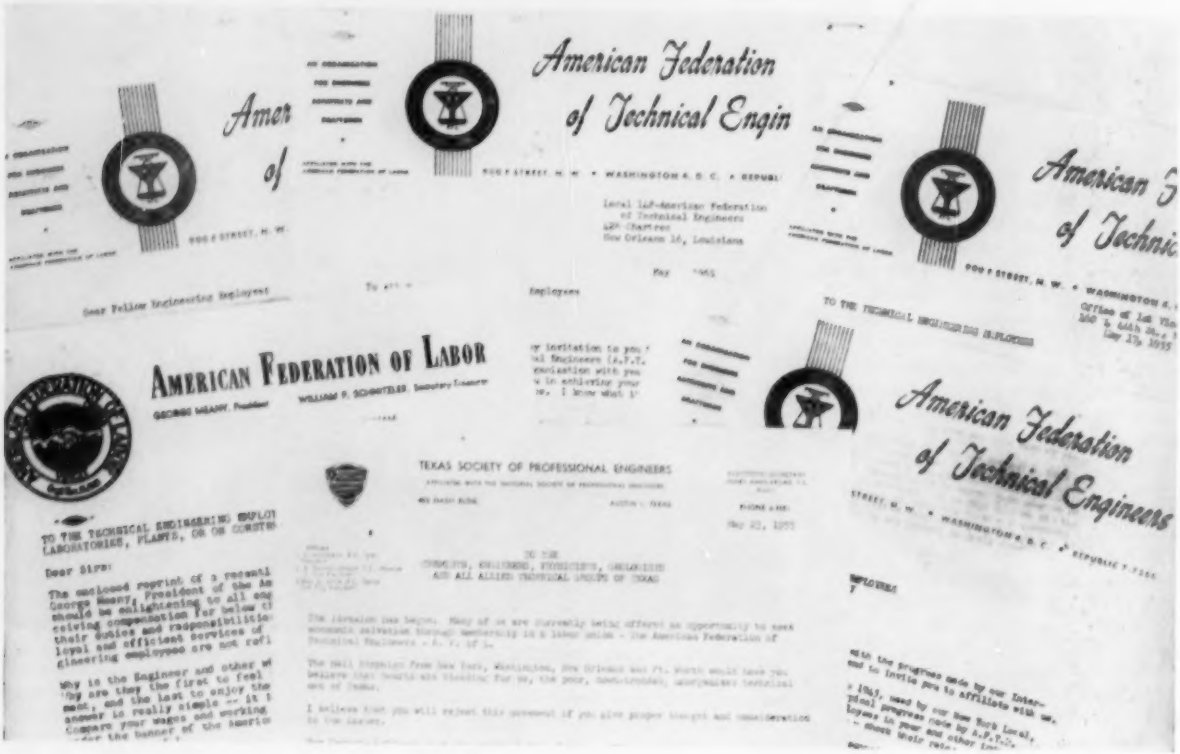
The hearing was recessed by Barbeck until July 20 to permit the commission and others to study the rules and review results of the current Spraberry field-wide gas-oil ratio survey.

Consensus of the operators was that the commission may be persuaded to raise the gas-oil ratio limit but isn't likely to approve lease oil allowables, gas-oil ratios, or gas limits.

Future of Spraberry . . . No matter where you hear Spraberry discussed, you come away with the feeling that Spraberry has become a naughty word to operators concerned with it.

Some predict it will soon become an associated gas reservoir then poop out altogether. Others say it actually already is an associated gas pool. One operator remarked that the only good thing about Spraberry is that it convinced the Railroad Commission that wider spacing than 40 acres is sometimes desirable.

One thing is certain, the only real aid for the floundering giant would be the discovery of some means of taking a good secondary crop of its oil. And this will have to come soon. If it doesn't Spraberry Trend Area field, as it is known today, won't exist in a few more years.


American Federation of Technical Engin
AMERICAN FEDERATION OF LABOR
TEXAS SOCIETY OF PROFESSIONAL ENGINEERS
American Federation of Technical Engineers

Union launches new oil invasion . . .

Engineers Are a Target in Texas

F. Lawrence Resen

HOUSTON.—A determined campaign is under way to unionize engineers and technical personnel in the sprawling oil and chemical industry of the Gulf Coast.

Full power of the American Federation of Labor is behind the well-organized effort.

Strategy in the initial phase of the campaign has taken the form of bombardment by letters. These have been sent out on letterheads of American Federation of Technical Engineers, an A.F.L. affiliate. They have gone to more than 400 engineers in Houston, Port Arthur, Beaumont, Freeport, Galveston, and Lake Charles, La. Personnel in Dallas and El Paso will be added to the drive later.

Plans call for full-time organizers to follow up the letters with personal contacts. Several organizers already are reported in the field. Theme of the letters, and probably talking point of the organizers later, is better pay, better working conditions, more benefits, and more prestige through union.

The current drive appears to be the best organized ever undertaken. A similar move in 1946 collapsed from poor organization and strategy. The new campaign, however, appears to be avoiding these mistakes.

Early targets are engineers concentrated in large numbers in the refining, research, and construction segments of the oil industry. Companies engaged purely in production report their engineers in the Mid-Continent area as yet haven't been contacted.

Union pattern . . . Observers point out the union drive probably will follow a pattern. The pitch will be made to engineers working with firms which hire large staffs, put technical men on routine jobs, and set up uniform pay schedules. These engineers often do not share management decisions, sometimes lose personal touch with their employers. They could be ripe for unionization.

But production and exploration employers report they doubt a unionization drive would succeed in their ranks if management remains alert. They point out their engineers usually are not concentrated in one center but are assigned on projects in the field. There they perform management functions and are more on their own. Their success often depends on their own initiative and decisions.

Sparkplug behind the current Gulf Coast drive is J. L. Raimist, New York, first vice president of the American Federation of Technical Engineers. He visited this area about 2 months ago, collected a mailing list, and laid groundwork for the letter barrage and full-time organizers.

Raimist says the letters are "just the start." They are aimed at getting a nucleus of interested people in a large number of organizations. When this is accomplished, full-time organizers will move in. They will work with the nucleus to enlist support of others.

Appeal to pocketbook . . . The first

Unionism or Professionalism? . . . Two Opposing Views

J. L. Raimist, first vice president of the American Federation of Technical Engineers, in an interview said:

"The engineer has always been a lost sheep. I have had it told to me that engineers can be bought at a dime a dozen—even by people from some of the companies with whom we have contractual relations today.

"We feel the engineer should unite for the same reason that the 13 colonies united to form the U.S.A.

"An engineer is a very talkative person about his engineering, but he is the most timid soul about his economic well-being. He has spent so much time perfecting himself in engineering that he has spent no time or very little in learning how to protect himself economically.

"There's no conflict between ethics and unionization. Unionization emphasizes ethical conduct and ethical economic consideration.

"We do not go after the administrative or management type of engineer because of his position with the employer. Organization efforts are directed at people classed from engineering trainee or junior draftsman up to and through top designers and checkers.

"If squad leaders are the type who give technical supervision only, we are interested in them. If a squad leader has any management authority we're not interested."

J. B. Dannenbaum, vice president Texas Society of Professional Engineers, wrote technical men in Texas:

"Our society believes the regimentation fundamentally inherent in unionization is incompatible with the individual responsibility and independent judgment required of a professional man. We dare not be the captive of any group.

"Your work and my work is essentially creative, predominantly intellectual and varied in character, involving consistent exercise of discretion and judgment. All of this as opposed to the routine mental, manual, mechanical or physical work associated with the craftsman.

"The unionization of the technical professions would be a great leap forward in our progress toward mediocrity. Leveling by fiat unfortunately tends downward.

"Under the collective bargaining system, where would the inspiration for new ideas and plans originate? The incentive destroying creeds of the trade union would soon stifle all individual initiative. Can the output of your mind be regulated to fit production standards established by union bosses?

"Freedom is too high a price to pay for economic advantage. It is too high a price to pay for group security. It is too high a price to pay for the loss of professional standing."

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series of letters hit at the paycheck. The technical men were told they work at a disadvantage salarywise from their fellow workers in the north.

The letter reported organized technical men in the north were being paid better. Another letter declared unorganized engineers and other white collar workers are exploited, feeling effects of business curtailment first and enjoying fruits of prosperity last.

A third letter was mailed by Russell M. Stephens, national president of AFTE. He informed engineers that just the threat of unionization causes many employers to increase wages and benefits. This move is to discourage unionization, he said. Stephens added that such a move doesn't work because employes wonder why it took so long to get the overdue wage increase. They figure, he stated, that it pays to unionize to get more of the same. He included application cards in the letter to be filled out and returned.

A week later, Curtis G. Luttrell, business manager of the New Orleans local of AFTE, asked the Texans in another letter how their working conditions compared with those of manual tradesmen. He declared the organized carpenter, teamster and bricklayer are better off dollar-wise than the unorganized engineer with all his degrees.

Raimist said he is getting favorable response to his latest letter. He told The Oil and Gas Journal his campaign will not attempt to enlist the administrative or management type of engineer because of his position with the employer. He added efforts will be centered on people classed from "engineering trainee or junior draftsman up to and through top designers and checkers."

Raimist also declared the present drive will not include personnel in oil production or pipelining but said they might be added in the future.

He explained his 50,000-member union is composed of about 50 per cent graduate and professional personnel. He reported the union already had working agreements with such firms as Lummus Co., Foster Wheeler, Stone & Webster, General Electric, Radio Corporation of America, Lederle Laboratories, General Bronze Corp., and Bechtel Corp.

Unions opposed . . . Meanwhile, the Texas Society of Professional Engineers has moved to counter the union drive.

J. B. Dannenbaum, vice president of the society, termed the union effort the best organized approach he's seen. In a letter to society members May 23, Dannenbaum argued that independent judgment required of professional men would be regimented under unionization. He warned that engineers would be involved in jurisdictional disputes, slowdowns and feather bedding. He also claimed incentive-destroying creeds of the union would stifle all individual initiative.

The National Association of Professional Engineers has taken an even stronger stand in the issue. It has stated "it is definitely unprofessional for a professional engineer voluntarily to join a heterogeneous labor union dominated by or obligated to unprofessional groups." It adds: "When promoted to professional responsibilities . . . (he) cannot continue his labor union affiliations without sacrifice of professional status."

Raimist, however, denied any conflict between ethics and unionization. He said "unionization emphasizes ethical conduct and ethical economic consideration."

Labor's background . . . A union for engineers is not new. Raimist's organization was formed in 1918 as the International Federation of Technicians, Engineers, Architects and Draftsmen. Its name was changed several years ago to avoid confusion with a similar CIO group.

Until the 1930's the union confined itself primarily with engineers in federal civil service and the shipbuilding industry. It still has considerable strength in those fields. However, during the depression it began to branch out to cover every industry hiring technical, engineering, architectural, chemical, bacteriological, surveying and similar scientifically trained personnel.

Other unions also are in the field. The Engineers and Scientists of America was organized nationally in May 1952. A number of independents also are operating. These include Associa-

tion of Industrial Scientists, Shell Oil Co., Emeryville, Calif.; Research and Engineering Professional Employees Association, Standard Oil Co. (Ind.), Whiting; and Association of Professional Engineers, Chemists and Scientists, Laboratory Division, The Texas Co., Port Arthur.

Nor is union opposition new. NAPE reported the basic elements in the dispute between professionalism and unionism have not changed through the years. NAPE declared its first president, D. B. Steinman, summed up its objections to unionism in 1939 and said his argument still holds.

Steinman declared unionization "places sole emphasis on wages and hours and membership instead of qualifications and quality of service. It tends to pull all members down to the same level. In union warfare it blinds its disciples to common decencies of fair play, mutual consideration and loyalty. Unionization is identified with the trades and is inconsistent with the professional spirit and attitude."

Calls for improvements . . . NAPE, however, said it recognized the lot of the experienced professional man could be improved. It pointed out that starting rates of fledgling engineers have increased sharply since the war. But experienced engineers have been left behind with only modest percentage increases in salaries.

At the same time, the experienced engineer has seen his pay shrink even more sharply when compared to wages of skilled laborers. Bureau of Labor Statistics showed that between 1941 and 1951 pay of engineers with 15 years' experience dropped more than 35 per cent compared with median pay of skilled laborers.

These facts plus uncongenial employment conditions in many instances and lack of professional status have been ammunition for union organizers. NAPE said cooperative efforts between enlightened management and forward thinking engineers can solve the problem. NAPE suggested these steps.

. . . **Give engineers** much more information on company policies and salary practices. Companies should not allow economic position of experienced employes to deteriorate in comparison with newcomers.

. . . **Assign appropriate titles** and privileges to recognize professional status.

. . . **Provide opportunities** for more education and counseling to help the engineer develop.

. . . **Find out what is troubling** the engineers and correct where possible.

. . . **Make it possible** for the engineer to make a maximum contribution and reward him according to his performance.

Depression baby crop means . . .

. . . Too Few Oil Scientists

Bertram F. Linz

WASHINGTON. — The shortage of researchers in the oil industry is a hot problem. It will get hotter before it cools off. And it probably won't begin to cool for 5 to 10 years.

That, in effect, is what the National Science Foundation will say in a report soon on a study of industrial research being made through the Bureau of Labor Statistics.

Eventually, a detailed statistical analysis of the situation will be released by the foundation. It will be based on a questionnaire sent to 12,000 companies. Every major oil company received a questionnaire and every company responded, a degree of cooperation which foundation officials said has been given by no other industry.

The forthcoming report is based on personal interviews with the research directors of a selected list of 200 companies. A half dozen were oil companies. The report will show there is today a major shortage of scientists and engineers. All companies agreed there is need for better qualified, more highly trained personnel. A number of firms have been forced to curtail planned increases in research and development programs because of this lack.

Oil industry hurt . . . Industry is carrying the greatest part of the national research effort. It conducts research costing $2,500,000,000 a year, approximately 65 per cent of the total $3,900,000,000 spent in this field. Federal and state funds finance 55 per cent and industry 42 per cent of this total.

Here is the picture developed by The Oil and Gas Journal:

. . . **The oil industry** is one of three most seriously affected by the shortage of scientists and engineers. The other two are chemicals and electronics.

. . . **The demand** for this type of personnel will be stepped up not only by normal technological development of industry but also by the spread of automation. Automation alone, 15 years hence, is expected to absorb the 8,000,000 or 10,000,000 college students then graduating.

. . . **The present lack** of personnel can be traced directly to low birth rates during the depression years. The birth rate held fairly steady during the 1920's. It dropped sharply in the next decade. Then it jumped in 1942 and the trend since has been upward.

. . . **This year is expected** to be the low point in scientific and engineering college graduates. Over the next 9 years there should be a gradual increase. This will not be due to a higher birth rate but, more likely, to the efforts that are being made to encourage young people to go into scientific fields.

Shortage to get worse . . . Around 1964 a sharp increase in graduates is expected, reflecting the jump in births in 1942. But in the meantime, the demand for scientists and engineers will continue to mount. Thus there is the probability that the shortage will be greater, rather than less, for a number of years to come.

This year about 20,000 students will graduate with bachelors' degrees in engineering and 9,000 in science. But one prominent scientist estimates these 29,000 students will be little more than a third of those needed. He figures about 75,000 would be required to meet the increase in research plus the need in production, sales, design, management and replacements.

The foundation's study of industrial research covers that by trade associations as well as companies. Trade association research brings developments of value to whole industries. But the majority of these organizations find it difficult to finance all the research and development they feel they should carry on.

An outstanding example of how this type of effort benefits a whole industry was cited recently by Dr. Alan T. Waterman, director of the foundation.

This was a basic research problem conducted by the American Petroleum Institute, involving the forms of equilibrium that can exist between liquid petroleum and gaseous products, particularly at high temperatures and high pressures. Some interesting results of the work became available about the time that refining companies were having difficulties with high-temperature, high-pressure cracking processes. These results, intended to increase the general knowledge of the industry, supplied the clue that led to the successful solution of the cracking problem.

But this type of work, as well as direct industrial research, will be limited over the next few years to the amount that can be carried on with the limited supply of scientific and engineering personnel. It is a situation that is expected to get worse before it becomes better.

T.G.T. Expands in Oil

Big gas transporter acquires Bay properties in $19 million deal; it's fast emerging as fully-integrated oil operator

HOUSTON.—Tennessee Gas Transmission Co. is fast emerging as a fully integrated oil operator—complete with petrochemical interests.

In a $19 million deal completed this week, the giant gas-transporting firm acquired oil production properties and two refineries of Bay Petroleum Corp. The plants are located at Denver and New Orleans.

Earlier T.G.T. teamed with Food Machinery & Chemical Corp. to buy a government-owned butadiene plant. The two formed Petro-Tex Chemical Corp. as the operating company *(The Oil and Gas Journal, May 30, 1955, page 55).*

Gardiner Symonds, president of T.G.T., said the Bay purchase was the latest move in his company's policy of expansion. He said the firm planned to acquire oil and gas properties through purchase as well as exploration and development.

In addition to the two refineries, T.G.T., took Bay's oil and gas producing properties located mainly in Texas, Kansas, Oklahoma, Colorado, and Wyoming. The Denver refinery has a 12,000-bbl. daily capacity and the other at Chalmette, near New Orleans, has a 20,000-bbl. daily crude charge capacity.

Symonds and Chester Clark, vice president of Stone & Webster Securities Corp., announced the purchase. Stone & Webster and Springbank Oil & Gas Co. recently bought 96 per cent of the Bay stock. A stockholders meeting last week voted to liquidate the Bay firm. *(The Oil and Gas Journal, May 30, 1955, page 58.)*

Present holdings . . . Moving gas from the Gulf Coast area to markets in the northeastern states is still T.G.T.'s chief business. But the fast-growing concern has become diversified in the last few years.

T.G.T. moved an average 1.385 billion cubic feet of gas daily through its 8,177-mile system last year. It also has built up a substantial production division. This includes 858 net oil and gas wells, 38 million barrels of net oil reserves, 54,991 net producing acres, and 242,783 net acres of unproven leases.

The company's crude production averages about 14,000 bbl. daily. The Bay properties will add about 5,300 bbl. daily to this for a production total of nearly 20,000 bbl. Since T.G.T.'s new refineries require 32,000 bbl. daily, the move still forces the company into the market for oil. But observers expect an active drilling and exploration program now under way to erase this deficit in short order.

Liquid production . . . Gas-processing plants have also figured largely in the gradual diversification moves of T.G.T. In 1951 it began operating stripper units at the Gabe, Ky., hydrocarbon-extraction plant. This facility can handle 900 million cubic feet of gas daily from T.G.T.'s main transmission system. It extracts 420,000 gal. per day of ethane and liquid products for delivery to the nearby petrochemical plant of Olin-Mathieson Chemical Corp.

The next year T.G.T. obtained through its affiliated Tennessee Production Co. the Eagle Lake processing plant of Del Rey Petroleum Co. in Colorado County, Texas. This plant can process 100,000,000 cu. ft. of gas daily, recovering 82,000 gal. of liquid products. T.G.T. later merged with Tennessee Production, adding the Banquete gasoline plant in Nueces County, Texas. It recovers 83,000 gal. daily of products from 100,000,000 cu. ft. of gas.

Last December, T.G.T. bought a majority interest in Far West Oil Co., which added an oil production of 1,600 bbl. per day.

THE NEW T.G.T.

Gas processing plants:
Gabe, Ky., 900 M.c.f. per day, 420,000 gal. per day liquid products.
Eagle Lake, Tex., 100 M.c.f. per day, 82,000 gal. per day liquid products.
Banquete, Tex., 100 M.c.f. per day, 83,000 gal. per day liquid products.
Holliday, Archer County, Texas, 3 M.c.f. per day, 2,500 gal. per day liquid products.
Refineries:
Denver, 12,000 bbl. crude-oil capacity, 3,600 bbl. catalytic cracking capacity.
Chalmette, La., 20,000 bbl., crude-oil capacity, 8,000 bbl. catalytic cracking capacity.
Production:
14,000 bbl. per day crude oil (estimated)—858 producing wells.
5,300 bbl. per day (from Bay purchase, estimated).
Gas transmission:*
8,177 miles pipeline; 507,852 compressor horsepower; system capacity 1.6 billion cubic feet daily.
Petrochemical:
Petro-Tex Chemical Corp., Houston (half-owned) 90,000 tons per year, butadiene.

*Does not include this year's expansion program.

Research Laboratory on Wheels

This test car developed by Esso Research & Engineering Co. has a high-speed movie camera mounted in the dashboard to record scientific data on power, rate of acceleration, speed, and other performance factors important to the development of fuels and lubricants. The camera records instrument readings at rates up to 85 frames a second. In just 15 seconds the film produces more than 25,000 pieces of information used by researchers. The sun visor holds a tape-recorder microphone for the driver's comments during tests. Electricity for the test equipment is supplied by a generator in the trunk of the car.

Research points way toward . . .

. . . Fully Automatic Refinery

KINGSVILLE, Tex. — The pathway of automation is leading gradually, but almost certainly, to the totally automatic refinery. This goal will not be reached by leaps and bounds, but rather by plodding the devious path plotted by research.

Another important milestone has been passed by a major company which installed a central control point on a refining unit which will govern its entire operations, tank farm included.

Strides made in the development of "data-reduction" or information systems for use in the refinery were noted by Paul Condit, Houston engineering specialist, who spoke at the tenth annual Short Course on Gas Technology at Texas A. & I. College. These data-reduction systems bring to a central control point all pertinent unit information. By use of an automatic printer, data normally logged by operators are recorded hourly, or at any other selected time interval.

Deviations from specified conditions are recorded as they occur. The time delay in hand-written logs is eliminated, and the data may be used immediately to correct plant conditions. Since plant processing adheres more stringently to specifications, the refiner gets a higher-quality product and more throughput.

Gradual trend . . . Automation is not a revolution, as some have described it, Condit said. It is a gradual transition through control technology. The realization that it can pay good dividends has aroused the interest of management.

Value of an information center is its removal of what Condit calls "operational rubber." This is the investment going to waste because equipment is not used to best advantage. An operator cannot watch each instrument in a continuous process operation. The plant is not operating at peak efficiency, and costly slack exists.

Savings . . . How much this slack in plant operations costs is an unknown factor. But experiments show the cost is considerable. Technicians have been placed in a plant to keep a constant eye on every function. By rigidly controlling the operations, researchers found that plant throughput over an extended period increased up to 7.2 per cent.

By replacing the experimental technician group with an automatic information center, the refiner can accomplish practically the same thing, and at lower costs.

More tangible results of an automatic information system can be found in product quality. Some processes are extremely sensitive to temperature changes. If the temperature is kept at exactly the right level, as can be accomplished through automatic controls, product quality and throughput will both increase.

Roadblocks . . . In the transition toward the goal of the automatic refinery, several roadblocks still must be removed through research. Instruments must be extremely sensitive to match the efficiency of the information system.

The information system can pick up the signal from the sensing element, translate it into an electrical output, carry it through a scanner and measurement system, convert it into digits, pass it through a code translator, and feed it into a printer, computer, and punch-card machine. All this is done with an error margin of only 0.1 per cent. Sensing elements, however, may be off as much as 2 per cent, thus canceling many of the advantages of automatic controls.

Emphasis in the instrument field, Condit said, is on the sensing elements. Some of the immediate goals are:

. . . Greater accuracy of standard linear values such as pressure and temperature.

. . . A complete evolution of flow measurement, primarily to eliminate the square functions and obtain a sensing element that will put out a linear signal to flow with accuracies not now possible.

. . . Development of sensing elements to measure functions not now available in industrial-type instruments.

Work Starts at Refinery Site

DELAWARE CITY, Del.—The job of moving 2,400,000 cu. yd. of earth has begun at the 450-acre site for Tide Water Associated Oil Co.'s giant new refinery to be located here. The work is being done by George M. Brewster, a subcontractor of C. F. Braun & Co., engineering contractors for the 130,000-bbl. per day refinery.

When the refinery site is leveled, the main processing units will be built in a strip measuring 1,000 yd. in width and extending about a mile parallel to the Pennsylvania Railroad. Other units will be located nearby, facing the main process area. The site proper is about 1½ miles inland from the Delaware River, where extensive tanker and barge facilities will be installed.

A large construction depot is going up near Delaware City. At the peak of the 18-month construction period, Braun estimates about 4,000 construction workers will be needed.

The construction depot and the process area just to the east represent only a small fraction of the 4,500 acres purchased near here by Tide Water. As construction gets under way, 8 to 10 carloads of material will move into the area daily, on a temporary railroad spur. The largest items will come in by barge to a temporary pier on the Delaware River.

The largest building will be a steel frame structure sheathed with corrugated metal, which will serve for maintenance and storage. It will be converted to a permanent service building when the refinery is completed.

Refinery Trends Cited

Changes expected in processing techniques are outlined by speakers at Fourth World Petroleum Congress in Rome

ROME.—Some indications of what is coming in petroleum refining are cropping up here at the Fourth World Petroleum Congress.

Many of the formal papers, prepared last year, deal with conventional processes and techniques. But here and there are hints of what is in the wind.

Pentane isomerization is getting some attention. Continued pressure on octanes is bringing this avgas process back into the picture, this time for motor fuels.

The broadening of catalytic reforming to include varied feed stock is also noted. Variations of the conventional once-through cat reforming process, already publicized in the United States, received some attention in updated presentations.

Naphtha reforming . . . More light was shed on naphtha reforming in a paper "Chemical Conversion by Isomerization and Dehydrogenation with Catforming" by R. D. Bent of Atlantic Refining Co., Philadelphia.

With coauthors M. J. Fowle and B. E. Milner, Bent presented three ways Atlantic's Catforming process can be used: alone, in conjunction with thermal reforming, or in conjunction with solvent extraction of catformate and paraffin recycle.

Their study first concerned the conversion of heavy naphthas and blending of unprocessed light naphthas. They next considered the processing of both light and heavy naphthas.

For situations requiring a limited volume of very-high-octane product, they concluded that the processing of only the heavy naphtha was indicated. This could be done by severe once-through Catforming, or by combination of milder single-pass Catforming followed by either thermal reforming or solvent extraction-recycle. They found that product octanes within certain yield limits increased with the above steps, in that order. But the incorporation of thermal reforming and solvent extraction-recycle also increased costs.

For the more prevalent situation, calling for octane improvement of both heavy and light naphthas, they found that once-through Catforming of essentially all of the straightrun naphtha is indicated.

As octane requirements rise, however, refiners may find that they cannot reach the required quality level by this means, and combination processing must be considered. Then, they will find that they can obtain higher octane levels by thermally reforming Catformate, and still higher by extraction of paraffins and recycling or Catforming in a separate unit. They noted, however, that while these modifications will boost over-all octane of the refiner's gasoline pool, they involve substantial increases in investment and total operating cost.

The Atlantic authors touched on another timely subject concerning the low-octane pentane fraction. The Catforming process, they said, is ideally suited to the isomerization of normal pentane to isopentane. A simple, low-pressure single reactor unit will do the job. A very low yield loss accompanies extensive conversion of normal pentane, they said.

They presented a chart which showed production of butane-and-lighter ranging from 0.25 to 1.75 per cent of feed at corresponding isopentane yields of 7 to about 67 per cent of product, respectively.

This isomerization process using Catforming catalyst promises to become important in the manufacture of motor fuel, particularly from natural gasoline sources, they noted.

Isomerization with Platforming . . . In discussing "Platforming, Present and Future," Vladimir Haensel and J. F. Walter of Universal Oil Products Co., also took note of the isomerization of pentanes and hexanes to produce more highly branched paraffins.

Advantage of this ability of the Platforming catalyst is realized by some refiners who are charging a full-boiling-range gasoline to their Platforming units, they said.

The extension of catalytic reforming to processing of cracked fractions was noted by the U.O.P. authors. A number of Platforming units are now operating on blends of straightrun naphthas and thermally cracked and coker gasolines to improve octane, stability, and lead susceptibility of the latter. Many more will follow suit.

This practice will gain momentum with the wider application of hydrogen pretreatment of such stocks. Unifining, they reported, will remove sulfur, nitrogen, and metals from these stocks, making them admissible to Platforming units. This use of byproduct hydrogen from the reforming step will greatly widen the range of feed stocks which can be catalytically reformed.

T.C.C. trends . . . A simpler and more effective method of handling heavy charge stocks to Thermofor catalytic cracking units was reported by E. V. Bergstrom, V. O. Bowles, L. P. Evans, and J. W. Payne of Socony Mobil Laboratories, New York.

This involves injecting the entire charge stock directly into the top of the catalyst bed through a simple manifold submerged in the catalyst entry-zone at the top of the reactor. This gives uniform distribution of the heavy unvaporizable component of the charge with minimum pressure drop and is more compact than the falling-curtain device. It permits charging any type of gas oil encountered in the refinery, the authors said.

New Pipeline Will Carry Coal

PITTSBURGH.—The first pipeline for moving coal will be started late this year by Pittsburgh Consolidation Coal Co., the world's largest coal producer.

If successful, the project could open an entirely new field to oil and gas pipeline construction techniques.

This first coal pipeline will be 108 miles of 10-in. from Pittsburgh Consolidation's Georgetown mines in eastern Ohio to Cleveland Electric Illuminating Co.'s Eastlake power plant northeast of Cleveland. Construction will start this fall as soon as right-of-way can be procured.

Right now there are no other coal pipelines in the offing. But prospects are good for the growth of systems of coal pipelines to power plants, once the advantages of this conveyor method have been demonstrated.

The new coal line will cost $9 to $10 million and have a capacity of at least 1,200,000 tons per year. A mixture of coal and water will be pumped in a slurry through the line. At a dewatering plant to be built by C.E.I., the coal will be dried before going to the company's boiler plant.

Plans for the project have been under consideration for several years by the engineering and research department of Pittsburgh Consolidation. The construction program will be handled by Ford, Bacon & Davis, Inc., which will issue specifications, let contracts, and supervise the work.

Delivery of 18,000,000 tons of coal over a 15-year period is provided in the contract between Pittsburgh Consolidation and Cleveland Electric Illumi-

nating. This amounts to a rate of 3,288 tons per day.

In heat value this would be equivalent to 15,000 bbl. per day of crude oil or 80,000,000 cu. ft. per day of natural gas.

After the pipeline is in operation, most of the big Georgetown coal mine output of Pittsburgh Consolidation will still move by rail.

Although the pipeline has the right of eminent domain, the coal company preferred to avoid lawsuits by an arrangement that would be acceptable to the railroads. The pipeline will cross under railroads at 11 points.

Three railroads—New York Central, Nickel Plate (New York, Chicago and St. Louis), and Pennsylvania—are now cooperating with the project.

A 10-year option has been given these railroads for acquiring part of the ownership of the pipeline in partnership with Pittsburgh Consolidation Coal Co., which will initially be the sole owner.

New Gulf Process

Hydrogen-treating units scheduled at Port Arthur

PORT ARTHUR.—Gulf Oil Corp. last week took the wraps off a new hydrogen-treating process. At the same time it announced letting contract for two of the new units at its refinery here.

Named "Gulfining," the process employs byproduct hydrogen from catalytic reforming to desulfurize home-burning oils and further to improve their qualities by removing nitrogen compounds and unstable hydrocarbons.

A contract has been awarded M. W. Kellogg Co. of New York, to build two 20,000-bbl. per day units. One will process straightrun West Texas furnace oil, primarily for desulfurization. The other will charge catalytically cracked furnace oil whose unstable diolefins will be sufficiently saturated with hydrogen to prevent their forming high-boiling products which clog filters, burner tips and other furnace parts. The hydrogen-treated product will show greatly improved odor and storage stability and will be light in color.

Charge stock will be heated to 700° to 800° F., mixed with pre-heated hydrogen, and passed over a fixed catalyst bed at 600 psig. Hydrogen sulfide resulting from reaction of the hydrogen with sulfur compounds, will be stripped from the system and processed for the recovery of 20 to 40 tons per day of elemental sulfur. This latest development is a minor part of Gulf's multimillion dollar improvement and modernization program now under way at four of the company's refineries.

The new Gulf units fall in line with a refining trend of increasing hydrogen-treating capacity *(The Oil and Gas Journal, June 6, page 72).*

Penn Outlook Bright

Vast exploration program for Appalachian urged

PITTSBURGH.—Business conditions are improving for the Pennsylvania crude oil industry and prospects for the future are bright.

That was the tone of a report made to the Pennsylvania Grade Crude Oil Association at its thirty-second annual meeting here last week by its president, C. A. Chipman of Bolivar, N. Y.

Chipman declared that inventories of Pennsylvania crude are being built up and demand for refined products is increasing. He pointed out that this area's high-gravity crude is still proving popular for lubricating purposes.

Chipman said less than 0.7 per cent of the nation's total crude-oil production was Pennsylvania crude. But the area produced about 10 per cent of the domestic demand for lubricants. Nearly 25 per cent of each barrel of Pennsylvania crude is refined into lubricants.

The Pennsylvania oil men were told by another speaker, Dr. Herbert P. Woodward of Rutgers University, that the Appalachian basin still holds promise of new oil and gas production and should be more thoroughly studied by geologists. He said new geologic knowledge and improvements in prospecting and drilling should be applied to the area.

Woodward declared he thought the basin, which has produced high-grade crude for decades, has never been adequately prospected with modern methods. He urged the oil men to undertake a cooperative basin-wide exploration program to tap new oil and gas sources. He added:

"I do not believe any thoughtful and experienced geologist will write the basin off as fully explored or adequately drained of its oil and gas potential."

Rep. W. Sterling Cole, Bath, N. Y., congressman, declared atomic power will not revolutionize the American economy over night. He added it also will not make conventional fuels industries relics of the past.

Cole stated that new uses and increased demand for oil would replace any markets lost to atomic fuels. He also pointed out that various atomic tools already have been used to aid the oil industry. He mentioned radioactive tracers in pipelining and radioactive iodine in acidizing oil wells.

Industry Briefs

TULSA.—Deep Rock Oil Corp. is giving its stockholders the option of exchanging 150,000 shares of Deep Rock stock for preferred stock of Kerr-McGee Oil Industries, Inc., Oklahoma City, on a one-for-three basis. Kerr-McGee has filed a registration statement with the Securities and Exchange Commission covering 450,000 shares of 4½ per cent prior convertible preferred stock, $25 par value. Deep Rock acquired the stock in its recent sale of assets to Kerr-McGee.

OTTAWA. — The House of Commons has approved a bill incorporating Trans-Border Pipeline Co. The firm is one of two seeking to buy the section of 4-in. Canol pipeline between Skagway, Alaska, and Whitehorse, Y. T.

NEW ORLEANS. — Contract for construction of a big drilling barge has been let by Brown & Root Marine Operators, Inc., to Higgins, Inc., New Orleans. The barge will measure 300 by 90 ft. and will cost about $1,000,000.

WASHINGTON.—The Federal Power Commission has issued a certificate to Central Kentucky Natural Gas Co., Charleston, W. Va., authorizing it to acquire the natural-gas pipeline facilities of Frankfort Kentucky Natural Gas Co. Facilities include 41.7 miles of pipeline from Lexington to Frankfort, Ky., lateral lines to Versailles and Midway, Ky., and distribution systems in Frankfort, Versailles, and Midway.

PHILADELPHIA.—The biggest merchant ship scheduled for delivery from American yards this year—Sun Oil Co.'s supertanker Eastern Sun—was launched here last week. The tanker has a capacity of 250,000 bbl. and is the fourth of its kind delivered to Sun in the past 2 years.

SARNIA, Ont.—Imperial Oil, Ltd., has put into use three facilities completed recently as part of an $8 million expansion program at its refinery here. They included a $4 million lubrication oil blending, packaging, and warehouse plant, a $3 million mechanical shop, and a $1 million inspection laboratory.

DENVER. — Shawano Development Corp., Palm Beach, Fla., has been merged with Garnak Drilling Co., Denver. Garnak received about $6 million worth of Shawano stock under the merger, approved last week by Shawano stockholders. Shawano acquired 63 producing oil wells in Kansas, Wyoming, and Illinois.

ROCKY MOUNTAIN

First Pipe Shipped

New plant producing steel for Pacific Northwest line

PROVO, Utah.—Pipe for Pacific Northwest Pipe Line Corp.'s 1,466-mile natural-gas line is rolling out of the U. S. Steel Co.'s new pipe plant here at the rate of 3 miles a day.

This production schedule will be maintained until completion of the line, according to Charles W. Lee, vice president of U. S. Steel's western steel division.

The first shipment of the 26-in. pipe, 100 railroad carloads, was sent last week to Ignacio, Colo., in the San Juan basin, where the line will originate. It will extend through the Rocky Mountain region to the Canadian border in Washington State.

On hand for ceremonies marking the initial shipment was R. D. Ricketts, president of Fish-Northwest Constructors, which will build the $163,000,000 pipeline.

The firm recently awarded contracts totaling $11,236,000 covering 655 miles of the line from Ignacio to near Burley, Idaho.

Ricketts said contracts will be awarded this month for an additional 200 miles across the northeastern mountains of Oregon and 100 miles of laterals into Wyoming and Colorado.

Nebraska Tax Bill Passed

LINCOLN, Neb.—A bill levying a 2 per cent severance tax on oil and gas produced in Nebraska has been passed by the state legislature.

The measure now goes to the governor for his signature or veto.

Senators from oil-producing counties fought the bill, contending the tax would cripple the industry.

Denver-Julesburg Test Hits

DENVER.—The California Co. has the Denver-Julesburg basin's second pre-Cretaceous producing area in prospect at its 1 Priddy, 4 miles northeast of Black Hollow field in Weld County, Colorado.

The apparent discovery, near the town of Pierce, recovered oil on a drill-stem test at 9,161-80 ft. in the Permian-Lyons sand. Recovery on the test was 2,900 ft. of clean green oil.

The pre-Cretaceous production history in the Denver-Julesburg basin began in 1953 at a deep strike in Keota field, Weld County. That same year The California Co. hit the Lyons successfully at Black Hollow, the only currently producing area in that formation in the basin. Black Hollow has 11 Lyons-sand oil wells. The Black Hollow discovery led to several deep tests throughout the western side of the basin, but none met with success.

Contracts Awarded

Butte crude line may be finished by end of summer

BILLINGS, Mont.—Butte Pipe Line Co. has awarded contracts for construction of its $18,000,000 crude line to be built in Montana and Wyoming.

D. H. Lewis, vice president of Shell Pipe Line Corp., said work will begin this month and will be completed by the end of the summer if weather permits. Butte Pipe Line is owned jointly by Shell Pipe Line, Murphy Corp., and Northern Pacific Railroad.

Associated Pipe Line Contractors, Houston, obtained contracts for construction of sections 1 and 2 of the 450-mile line. They total 227 miles of 16-in. line from the Montana-Wyoming state line south to Guernsey, Wyo.

Anderson Brothers Corp., Houston, will build 82 miles of 10-in. and 6½ miles of 12-in. line from Glendive to Poplar, Mont.

O. R. Burden Construction Corp., Tulsa, will build 15 miles of 12-in. and 88 miles of 16-in. line from Alzada, Mont., to the Cabin Creek field near Baker, Mont.

About 33 miles of existing 12-in. line will be incorporated into the system south of Glendive, Mont.

The line will carry crude from the Montana portion of the Williston basin to the Platte pipeline at Guernsey and the Western pipeline at Fort Laramie.

Colorado Gas Line Started

COLORADO SPRINGS.—Construction has started on the first portion of Colorado Interstate Gas Co.'s Denver-Rock Springs natural-gas pipeline.

Houston Contracting Co., Houston, Tex., holds the contract on the 140-mile, 22-in. project. The line will extend from the company's control station east of Denver, to Laramie, Wyo. Eventually it will stretch 380 miles from Denver to near Rock Springs where it will link with Pacific Northwest Pipe Line Corp.'s system.

Estimated cost of the first project is $8 million. This includes the pipeline and three meter stations. Completion is expected within 4½ months. Work on the remaining portion of the line will be done next year.

Colorado Interstate also has budgeted about $3 million for drilling development and exploratory gas wells. The company plans to spend another $4,200,000 this year extending its gathering facilities.

Refining Briefs

NEW YORK.—Interest persists in new refining capacity along the East Coast. Two new plants are planned by Miami Oil & Refining Co. at Fort Pierce, Fla., and by Commerce Oil Refining Corp. at Portsmouth, R. I. Other independents also are thinking of building along the eastern seaboard and it is possible a second refinery may be built in southern New England.

NEW YORK.—Ethyl Corp. is launching a national promotion to encourage more auto driving by the American public. Its advertising slogan will be: "Drive more . . . it gets cheaper by the mile." Ethyl points out if the average car were driven 500 more miles each year gasoline consumption would jump 1.2 billion gallons.

TOLEDO. — Gulf Oil Corp. has started operating a new 10,000-bbl. daily Platforming unit at its 44,400-bbl. daily refinery here. It is the second of four units Gulf is adding. A 10,000-bbl. Platformer is located at the Cleves refinery near Cincinnati. A 17,750-bbl. unit is in operation at Philadelphia and a 30,000-bbl. unit will go on stream shortly at Port Arthur.

MERIDIAN, Miss.—The Texas Co. is building a 74,000-bbl. bulk terminal here. It will be supplied gasoline through the Plantation Pipe Line.

WILMINGTON.—Du Pont has reduced the price of its tetraethyl lead antiknock compound—the second price cut within 6 months and the fourth within 15 months. The new domestic price is 36.08 cents per pound for motor mix. The old price was 36.70 cents. Aviation mix has dropped from 40.28 cents to 39.66 cents. The new prices in terms of straight content are approximately 58.69 cents per pound for motor mix and about 64.59 cents per pound in aviation mix.

SOUTHWEST

Texas Taxes Settled

Only increase for the oil industry is in the corporation franchise tax; several minor statutes affecting oil added

AUSTIN.—The biggest and most confused tax squabble Texas has seen in years ended last week with the petroleum industry in the state faring much better than many had feared.

Gov. Allan Shivers signed into law June 7 new tax provisions which will bring in roughly $100,000,000 over the next 2 years.

The only provision which affects the industry directly was a hike in the corporation franchise tax from the old $2 rate per $1,000 to $2.25 per $1,000.

The industry is affected indirectly by a 1-cent raise in the state gasoline sales tax from 4 to 5 cents a gallon.

The final version of the big tax bill was molded by a senate-house conference committee early in June. The committee lopped off a portion of the house bill which would have made permanent an 8 per cent production tax on natural gas at the wellhead, rather than letting it fall to 7 cents beginning September 1956 as was scheduled.

It also deleted a senate-passed token tax on natural gas dedicated to transmission lines under long-term contracts. This tax, fixed at one-twentieth of 1 cent per M.c.f., was designed to draw gas pipelines into testing its constitutionality in court. If the pipelines lost, then the tax would probably have been hiked.

Other taxes defeated during the hectic 148-day session of the legislature included:

. . . **Processing taxes** ranging from one-fortieth of a cent to 1 cent a gallon on all combustible fuels manufactured by refiners, natural-gasoline plants, and others.

. . . **"Business activities" taxes** on value added by manufacturing, refining, chemical processing, pipeline, and utility firms.

. . . **Gross-receipts tax** on manufacturing of liquids by chemical, metallurgical, or electrolytic process. This one of course would have hit petrochemicals.

. . . **A large assortment** of increased oil and gas production taxes.

Waste bill dies . . . Time ran out on the so-called economic-waste gas bill sponsored by the Texas Independent Producers and Royalty Owners Association. The bill was awaiting action in the house, still in committee in the senate.

The bill would have given the Texas Railroad Commission authority to fix a minimum price for gas in a field or area where it determined waste was resulting from low prices.

Another price bill which would have given the commission the power to fix minimum prices for gas in the big Panhandle gas field also died in committee.

New petroleum laws . . . Though going easy on the industry taxwise, the legislature did pass several other new laws affecting oil and gas.

One gives the Railroad Commission the power to prevent pollution of surface or subsurface fresh-water sources resulting from oil and gas exploration, drilling, producing, or other operations. It gives the commission authority to require bonds up to $10,000 from anyone wanting to drill or deepen a well to insure that such wells would be plugged and abandoned properly.

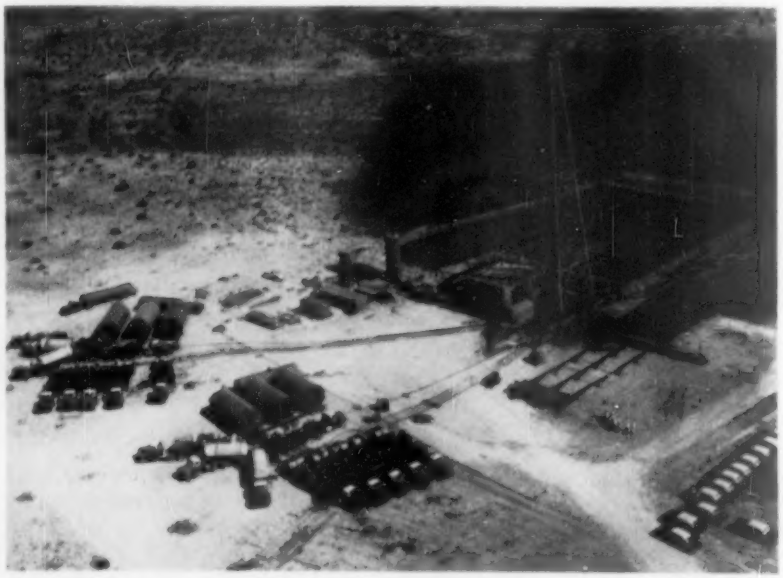
Another requires that bidders for state oil and gas leases remit separately from their bids an amount equal to 1 per cent of each bid as a special sale fee. The fee money would go to the commissioner of the General Land Office, who would return all fees except that on the high bid which the board accepted.

A third law permits extension of primary terms of oil and gas leases on University of Texas lands under certain conditions.

The General Land Office also was empowered to set up rules to regulate oil operations on the Gulf of Mexico state lands so as to prevent pollution of water, obstruction of navigation, and destruction of marine life.

The various boards for lease of state lands for petroleum operations were authorized in another new law to grant easements for oil pipelines on those lands.

Governor Shivers recently signed into law a measure passed by the legislature requiring cans of reconditioned motor oil to be plainly labeled as such.



Big Kick Put Into West Texas Well

The largest sand-fracture treatment ever given an oil we'l in West Texas' Permian basin was applied to a Tide Water Associated Oil Co. well in Ector County. The operation is pictured above showing special-purpose vehicles of Halliburton Oil Well Cementing Co. clustered around the well. A 75,000-gal. mixture of sand and oil was forced into the tight Devonian formation at a pressure of 4,800 psi. at a rate of 26.5 bbl. per minute. The well was rated at 150 bbl. daily and after fracturing recorded an initial potential of 588 bbl. daily of 42.6°-gravity oil flowing through 14/64-in. choke. The well is Tide Water 5 Tom McKnight in Headlee field near Odessa.

Cogdell Unit Asked

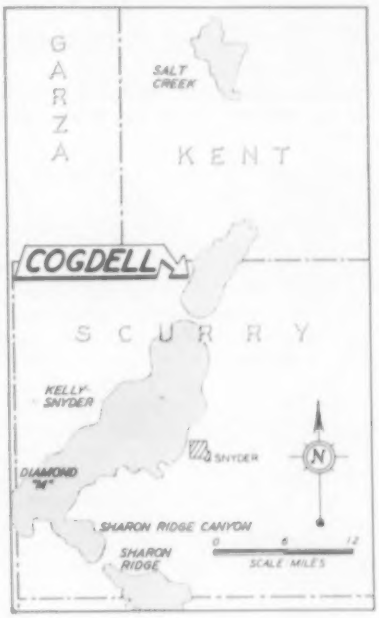
Scurry-Kent County proposal would be fourth in chain of unitized pressure-maintenance projects in Canyon Reef pay

SNYDER, Tex.—Operators in Cogdell field of Scurry and Kent counties in West Texas have completed plans for a pressure-maintenance project in the field's Canyon Reef pay which will hike ultimate oil recovery by 60,000,000 bbl.

The operators, led by The Texas Co., are awaiting approval of the Texas Railroad Commission of a program calling for formation of a 14,000-acre unit and for water and gas injection.

Commission endorsement of the Cogdell unit is expected soon. The project would fill in the last link in a chain of unitized pressure-maintenance operations in the prolific Canyon Reef pay extending from south to north almost all the way through Scurry County.

The units are the Sharon Ridge Canyon unit, the Diamond "M" unit, the huge SACROC unit in Kelly-Snyder, and Cogdell.



Recovery estimates . . . The four projects take in more than 80,000 acres and roughly 2,500 producing wells. Together, they will recover an astounding 1,000,000,000 bbl. of oil which otherwise would have remained underground. The recovery figures are based on operator estimates, which generally have proved to be conservative.

The bulk of acreage, wells, and oil recovery, of course, is contributed by the mammoth SACROC project in Kelly-Snyder field. This one takes in 50,000 acres and 1,238 wells. Ultimate additional oil is estimated at 795,000,000 bbl. Kelly-Snyder is the biggest field ever unitized for pressure maintenance.

Several miles to the north of Cogdell is Salt Creek field in Kent County, where still another pressure-maintenance operation is being carried out in the Canyon Reef. Salt Creek has about 109 producing wells on 8,850 acres. Injection of water and of gas in the northwest end has hiked the field's ability to produce without loss of pressure from 13,856 bbl. at the start to 21,000 bbl. daily.

Cogdell project . . . Cogdell field, discovered in December 1949, already has produced (as of April 1) 34,170,011 bbl. of oil and 28,660,238 M.c.f. of gas.

The field is essentially developed. It has 369 producing wells.

Operators plan to use 19 of these to inject water around the perimeter of the field. Another five will be used for gas injection along the crest of the structure.

Only 1 to 3 per cent of total fluid produced from the pool is water. Injection water will come from shallow sand and gravel beds adjacent to the Brazos River.

The reservoir operates primarily under a dissolved gas drive—least efficient of any of the natural drives. Operators have injected about 7.5 billion cubic feet of gas since February 1953 when they started a cooperative project to help maintain reservoir pressure.

Pressure originally was 3,120 psi. It had declined to 1,430 psi. by May last year. Another pressure survey was run last month, but results are not yet available.

So far no wells are being penalized for excess gas-oil ratios. Of the 369 wells, however, 27 are now listed as limited capacity and 10 more as marginal producers.

The Canyon Reef in Cogdell produces from about 6,800 ft. There is a maximum 758 ft. of gross reef pay, an average net reef section of 108 ft. Porosity and permeability aren't uniform, but average 10 per cent and 17.6 md., respectively.

Operators . . . Besides Texaco, operators in the field are Stanolind Oil & Gas Co., Chapman - McFarlan Producing Co., D. D. Feldman Oil & Gas Co., and Humble Oil & Refining Co.

They feel that by injecting about 30,000 bbl. of water daily plus all available gas into the reef they can increase recovery from a primary estimate of 135,000,000 bbl. to a total of 195,000,000 bbl. The 135,000,000 bbl. estimated recoverable by primary means was figured to be about 26 per cent of that originally in place.

Participation in the unit is based on ability of the wells to produce and on net pay.

Texaco as unit operator has asked the commission for permission to add more input wells, transfer allowables of inputs or those wells shut in for more efficient operation, and exempt input and shut-in wells from normally required commission tests.

CANADA

Extension Granted

Westcoast given until 1957 to complete line

OTTAWA—Westcoast Transmission Co., Ltd., has been granted a 2-year extension of the completion date for its proposed natural-gas pipeline tapping fields in the Peace River area.

Canada's Board of Transport Commissioners also approved Westcoast's application for permission to increase the pipe size from 24 to 30 in. and to eliminate plans for laterals to Kamloops and Vancouver, B. C., and from Brookmere to Osoyoos, B. C.

Supply of gas to these areas, while coming from Westcoast's line, will be handled by British Columbia Electric Co., Ltd., and other companies which will construct lines from the main pipeline.

The 650-mile Westcoast line will cost an estimated $162,000,000 and should be supplying the Vancouver area by the end of 1956. It is expected to start feeding gas to the U. S. Pacific Northwest by September 1957. The new deadline gives the company until October 31, 1957, to complete the project.

Company officials expect the Federal Power Commission to approve import of the Alberta and British Columbia gas into the Pacific Northwest states within the near future.

So far this year $1,500,000 has been spent in acquiring right-of-way and making detailed surveys of the route, and spending is continuing at a rate of $300,000 a month. The necessary pipe has been ordered.

NATIONAL AFFAIRS

Alaskan Leasing Planned

Interior Department revives proposal to open reservation covering more than 20,000,000 acres for oil development

WASHINGTON. — The Interior Department moved last week to open northern Alaska to oil and gas development.

A year-old plan to cancel a wartime reservation of more than 20,000,000 acres for government use was laid before the chairman of the House and Senate armed forces and interior affairs committee by Acting Secretary Clarence A. Davis.

Since the reservation was made by presidential order, it could be revoked without action by Congress. But Interior officials feel that assent by the committee is politically desirable.

The area to be opened is the last of three tracts reserved by President Roosevelt in January 1943 in Public Land Order 82. The other tracts, in the Alaska Peninsula and Gulf of Alaska, were opened in 1946. Oil and gas prospecting is now being carried on in both areas by private firms.

Area involved . . . Generally estimated at between 20,000,000 and 25,000,000 acres (no accurate measurement has ever been made), the lands to be opened are roughly all of northern Alaska which drains into the Arctic Ocean, except for Naval Reserve No. 4.

This is the area which contains the Gubik gas field, lying on the southeast edge of the naval reserve. Alaskan interests have long planned a natural-gas pipeline from Gubik to Fairbanks, with possible extension later to Anchorage. The building of the line, however, has been held up by the delay in releasing the land to private development.

At the time the area was reserved it was believed that oil and gas deposits might be found in the naval reserve and surrounding territory. The Navy conducted a 9-year exploration program, which was suspended in March 1953. The only discoveries were a moderate-sized oil field, known as the Umiat field, entirely within the reserve, and the gas deposits at Gubik, lying mostly outside.

The naval reserve of some 28,000,000 acres would be retained by the Government as a possible future oil source. The Navy Department has said it has no objection to release of the lands outside the reserve. But some of the area may be held by the Government under Defense Department plans to ask certain reserves for defense purposes.

Lease plans . . . Once the lands are released, the Interior Department will offer competitive leases for lands on known geologic structures of producing oil and gas fields. Other areas will be leased for exploration and development on a first-come-first-served basis, the same as within the continental United States.

At the same time, Interior and the Navy Department will attempt to dispose of the latter's drilling equipment, which was declared surplus when the exploration program in the reserve was halted. It is believed that companies making leases would be glad to get equipment already on the spot, saving the cost of moving it from the U.S. and particularly over the rough terrain of northern Alaska.

Proposed pipeline . . . The basic engineering for the proposed gas line already has been done.

Engineering requirements and preliminary design for a 450-mile, 8-in. line were prepared by Arctic Contractors, Inc., when the Navy, anticipating a big discovery, was planning on piping oil from the reserve to Fairbanks. At that time it was estimated the line could be built for $20,000,000. The cost now is set at a higher figure.

It is believed that the Gubik field may have a dry-gas reserve of 300,000,000 M.c.f. This would give Fairbanks a 30-year supply at a rate of 20,000 M.c.f. daily. Last year it was estimated the gas could be sold profitably in Fairbanks at 50 cents per M.c.f., or 30 per cent less than coal.

Alaskan interests have been pressing for release of the area ever since the Navy quit its prospecting. A Senate subcommittee investigated the idea late in 1953, and Sen. Hugh Butler, then chairman, urged Secretary McKay to open the lands.

Pipeline Plans Revised

Texas Eastern offers new plan to supply products to East Coast; proposal centers around conversion of Little Inch

WASHINGTON. — A new plan to provide additional oil products transportation to the East Coast in the event of war was laid before Mobilization Director Arthur S. Flemming last week.

Texas Eastern Transmission Corp. stands ready to provide up to 800,000 bbl. daily of pipeline capacity in the event of an emergency. But it wants accelerated amortization on the money it must invest to do this and, reportedly, some government aid in carrying the project out.

Filing the formal application followed a week of meetings between Texas Eastern's top men and Interior Department oil officials. The details of the plan are quite complex and considerable time will be required to study them.

In general, Texas Eastern will:

. . . Convert the Little Inch line from natural gas to products. Texas Eastern has an application before the Federal Power Commission for authority to convert the line. FPC Presiding Examiner Emery J. Woodall gave the plan his blessing in April, and the commission is expected to follow suit.

. . . Put standby pumping equipment along the line to increase its capacity from the 235,000 bbl. daily of products to 375,000 bbl.

. . . Install standby pumping equipment along the Big Inch line. This would enable a quick changeover of the 30-in. line from natural gas to products, with a capacity of 425,000 bbl. daily.

. . . Provide standby compressor capacity on the company's new 30-in. line. This move would permit the new line to take over the Big Inch gas load.

Texas Eastern's proposal clashes with a plan of American Pipe Line Corp. to build a products line from the Gulf Coast to New Jersey. American opposed the Little Inch conversion before FPC. It has a certificate of accelerated amortization from the Office of Defense Mobilization and contends it has been "selected" to build a line meeting national defense requirements.

Agencies silent . . . Officials of agencies interested in the problem of East

WATCHING WASHINGTON

Bertram F. Linz

Boundary Decision Delayed

The Louisiana boundary dispute will dangle on the vine until next fall.

Operators who take leases from the Interior Department next month on tracts lying between 3 miles and 3 leagues off the Louisiana coast will not know for several months whether their lessor will turn out to be the federal Government or the state.

The state claims it has a 3-league boundary in the Gulf of Mexico. Since it measures its boundary from islands several miles off the coast, it contends its territory in some places runs out 30 miles or more. The federal Government says Louisiana has a 3-mile boundary, although it may own all islands lying within 3 leagues.

Atty. Gen. Herbert Brownell, Jr., explained the Government's position to the Supreme Court May 19. He asked the court to back him up by modification of its decree of December 11, 1950, in which it held the United States was entitled to the submerged resources of the gulf extending seaward 27 marine miles from the coast of Louisiana. That decree was affected, but not nullified, by the Submerged Lands Act of 1953 returning to the states all lands and resources within their "historic" boundaries.

Brownell's petition was filed too late for the state to reply and the court to rule before it ended its 1954-55 term June 6. Accordingly, the preliminary briefs and responses will be filed during the summer.

Until the court says otherwise, the Interior Department will act on the assumption that all lands beyond the 3-mile limit off Louisiana are part of the outer Continental Shelf. It has already refused to withdraw tracts inside the 3-league distance from the lease sale it has scheduled for July 12. But it is not expected that any further shelf-lease sales will be held before the court reconvenes.

Mergers Face Threat

Congress is moving to put the brakes on industrial mergers.

Sen. John Sparkman of Alabama has written a bill which would give the Government veto power over any merger involving a concern with assets of more than $1,000,000.

Under his bill, no such corporation could acquire another or be acquired, directly or indirectly, without notifying the attorney general's office and the Federal Trade Commission of its plans. The two agencies would have 90 days to think it over. If in that time neither objected, the merger would be permissible.

But there's a joker in the bill. The Government's failure to object to a merger does not mean it is approved. At any time it could start action with respect to the acquisition, if it was considered in violation of any law.

Plant Location Restudied

Bigger bombs — bigger problems. That's the spot in which mobilization officials find themselves in planning against enemy attack on refining and other industrial centers.

Industry originally was urged to put new plants a few miles away from points where enemy bombs might fall. Ten miles or less might make the difference between damage and escape, it was thought. But new information about the effects of atomic bombing indicate that a concept other than distance may have to be adopted now.

The blast and heat of new atomic weapons, and more particularly radioactive "fall-out," have greatly increased the radius of the danger zone. Fall-out, it has been found, may occur over a distance of well over 100 miles and in a new direction every time the wind shifts. The Weather Bureau is making maps twice a day showing the direction and area of fall-out from a number of major cities.

Studies now under way are looking to a new approach to the problem. The matter hasn't been widely publicized, but some officials are said to lean now to the idea that each industry and each plant may have to be considered separately from the standpoint of both the economics of location and defense.

Meanwhile, industry itself has no information on which to make its own studies for location of plants where they will be in least danger. The Atomic Energy Commission, from which the basic information must come, has not yet given out any data on which studies can be started.

Coast wartime oil supply declined to compare the merits of the two proposals. But they indicated there is no need for two lines, and the nod will be given the one which offers the least expense to the Government. American Pipe Line is asking the Government to support some $70,000,000 of the money it must borrow for building. It has not been disclosed what Texas Eastern is asking in the way of financial aid.

The Little Inch conversion also has been attacked, both before the FPC and in the courts, by three Mississippi-Ohio River barge operators. They argued before the FPC that the new line would "monopolize" oil transportation in the Ohio River Valley and put them out of business.

The whole question of coastal oil supply will be rehearsed shortly by the House armed services committee. The committee is expected to open hearings about the middle of next month on the question of a pipeline from Texas to California. But the East Coast pipeline is expected to be brought up because the Defense Department so far has refused to support any West Coast line until provision is made to insure supplies for the more highly industrialized Atlantic seaboard area.

Import Curb Ready

Some oil men want quick action when Ike signs bill

WASHINGTON.—A new reciprocal trade act, giving the President power to adjust excessive oil imports, is due to go to the White House for approval this week.

President Eisenhower is expected to sign the bill without delay. He said last month he would accept changes made in the administration bill by the Senate. Most important changes were clauses aimed at control of oil imports and stronger relief provisions.

Interest now centers on if, when, and how the new bill will be applied.

Oil imports this year have run considerably above the 1954 level. Domestic crude production also has increased, but to a lesser degree. Spokesmen for independent producers have said they will start a drive for limitations as soon as the bill becomes law.

The bill extends the 21-year-old trade act another 3 years. In that period, the President may make further cuts of 15 per cent in import duties. But for the oil industry, the big thing is the new approach to the problem of oil imports. It is based on the recommendations of the cabinet fuels committee.

The cabinet committee said that imports should be held at the same ratio

to domestic production as prevailed in 1954. It said if imports of crude or residual should "exceed significantly" that ratio, "appropriate action" should be taken.

This policy was adopted, the Senate finance committee said in reporting the bill, by its provision for presidential action. The mobilization director is authorized to report to the President when he believes imports are so heavy they threaten national security. The President then shall order an investigation "if he feels there is reason for such belief." If he determines a threat to the national security exists, "he shall take such action as he deems necessary to adjust" imports.

The President and the State Department are firmly opposed to quotas, for policy reasons. But there also are practical difficulties in the way. The Government is expected to use persuasive methods to the limit, to induce importers to police themselves, before resorting to drastic measures.

Harris Bill Squeaks By

Close committee vote encourages foes to predict House floor fight over lifting FPC controls on gas producers

WASHINGTON. — The Harris bill exempting natural-gas producers from Federal Power Commission regulation has passed its first big test.

But the House interstate commerce committee approved the measure by such a small margin opponents said they were confident it will not pass the House unless broadly amended.

The measure came out of committee only after a series of maneuvers which at one time stymied it overnight. After rewriting the bill originally introduced by Rep. Oren Harris of Arkansas, the committee split 14-14 on sending it to the floor June 7. Both sides sent a hurried call for reinforcements. The following day, after voting 19 to 12 against delaying the bill for 10 days, the committee voted out the bill 16 to 15.

There were two other developments during the week:

... **The FPC issued** proposed new rules to simplify the filing of rate schedules by both producers and pipelines.

Sen. Harley Kilgore of West Virginia urged the Senate interstate commerce committee to write a conservation policy into its version of the Harris bill.

The new FPC rule would require rate schedules to be published in the Federal Register, with copies mailed to all affected customer companies, within 10 days of filing. The changes could not become effective until 30 days after publication. Present rules do not require notice in the Federal Register and may become effective 30 days after filing.

Equality of fuels . . . Kilgore told the committee unrestrained use of gas for boiler fuel has shortened the life of our reserves. He said the FPC should "promote" conservation and should have jurisdiction over direct industrial sales.

The West Virginia senator was among the last to appear before the committee as it sought to wind up its hearings. It is considering the bill offered by Senator Fulbright of Arkansas, which is the same as the Harris bill.

Before voting to send the Harris bill to the floor, the House committee reversed itself and threw out an amendment approved previously. This called for a policy of equality for all fuels, requiring the FPC to see that productive capacity of all fuel industries is sufficient to meet present and future needs of the country. After they approved it, committee members decided the plan would not be practical for the commissioner to administer.

Here are main features of the Harris bill as it went to the House floor:

... **FPC regulation** of natural gas will start after completion of production, gathering, processing, treating and compression. It also will follow delivery into facilities of a person engaged in transporting it beyond the vicinity of the field where produced.

... **"Sale in interstate commerce** for resale" means only such sales as occur after transportation in interstate commerce has started.

... **Any increase in rates** or charges filed with the commission by pipelines, based on contracts made or renegotiated after the law becomes effective, shall be reviewed by the FPC. The agency will see whether the price is the "reasonable market price." The pipeline shall not be allowed to charge as an operating expense anything exceeding the reasonable market price.

... **Provision is made** for advance review of prices to be paid under new or renegotiated contracts. The FPC will fix the amount the natural-gas company will be allowed to charge as an operating expense for gas purchased under the contract. This will enable the pipelines to learn in advance whether the price agreed upon can qualify as the reasonable market price as determined by the FPC.

... **Determination of reasonable** market price by the FPC is extended to all future increases in price under escalation clauses in existing contracts. Exceptions are those providing for specific increases in price at definite dates or where the pipeline agrees to reimburse the producer for any increase in taxes.

... **Contracts containing** escalation clauses are not affected by the bill except for the determination of the reasonableness of price.

... **Pipeline companies** will be allowed the reasonable market price for gas produced by them and for gas bought from affiliates.

Panhandle Switches Plans

WASHINGTON.—A new plan to increase the winter peak-day capacity of its gas-transmission system was laid before the Federal Power Commission last week by Panhandle Eastern Pipe Line Co.

The company said it will increase the capacity by 160,000 M.c.f. daily. Half of the gas would be supplied through its subsidiary, Trunkline Gas Co., from its Gulf Coast reserves. Greater throughput as result of operating improvements on Panhandle's main line would account for remainder of the additional supply.

The new plan is an alternative to Panhandle's original idea of using an underground storage field near Waverly, Ill. Some weeks ago it was found that gas stored in the St. Peter sandstone at a depth of 1,800 ft. was seeping into higher formations. It was decided the field could not be put into shape for use next winter. But engineers are hopeful of eventually licking the problem of seepage.

Pipeline Hurdle Cleared

WASHINGTON.—The last legal barrier to American Louisiana Pipe Line Co.'s $130,000,000 Louisiana-Michigan natural-gas pipeline is down.

The Supreme Court refused to hear an appeal by Panhandle Eastern Pipe Line Co. A lower court decision held Panhandle Eastern was not injured when the Federal Power Commission gave American Louisiana permission to build the line last October.

The District of Columbia Court of Appeals refused to hold up the FPC certificate. It ruled Panhandle was not aggrieved, nor could it see any danger to Panhandle's markets.

Tidelands Bill Passes

California lease act lacks only signature of governor; Douglas Oil is high bidder on tract off Huntington Beach

SACRAMENTO.—A bill opening southern California tidelands to oil exploration and development lacks only the signature of Gov. Goodwin Knight to become effective. And he has stated he would sign it.

With outcome of the new offshore-leasing bill still in doubt, the State Lands Commission accepted bids last week for a 320-acre lease lying off the prolific Huntington Beach area. Bids indicated several major companies are eager to extend their activities into the tidelands.

The tidelands measure was temporarily smothered in the legislative mill when a senate committee voted to hold it over to the next general session in 1957. Resurrected only 3 days before adjournment on June 8, it quickly received senate approval. On the last day, the assembly unanimously approved changes made in the bill earlier.

Though the measure is not all the oil industry sought, it does open to exploration most of the tidelands between the north city limit of Newport Beach and Oceano in San Luis Obispo County. Excepted are areas lying offshore from beach communities and from Santa Monica to the Los Angeles-Ventura county line.

It also legalizes drilling from earth-filled islands and from platforms and piers. Another change from the old statutes is that royalties are fixed and bidding will be on a bonus basis. Competitive bidding on a straight royalty basis has produced some unusually high offers.

High bidder . . . Douglas Oil Co. was high bidder on the 320-acre tidelands parcel lying offshore from the Jones pool at Huntington Beach when the State Lands Commission opened bids from 13 companies June 8.

Its offer was a royalty factor of 7.07. Those of two other companies exceeded 5, approximately what Richfield Oil Corp. bid a year ago to win the 1,175-acre parcel offshore from Rincon.

Bids were submitted by The Texas Co., General Petroleum Corp., Standard Oil Co. of California, Signal Oil & Gas Co., and Richfield. It is anticipated that the Lands Commission will make the award at its meeting June 13.

A provision of the bidding was that maximum royalty would be 75 per cent, with the usual 16⅔ per cent minimum. Were it not for this, Douglas' offer would involve royalty payments exceeding 100 per cent for any well producing more than approximately 75 bbl. daily.

All bids were based on drilling from upland sites. If Dougles uses the drill site Standard agreed to make available to all companies participating in the bidding, it must pay Standard either a small royalty or rental.

Shell Hits Deep Pay

Discovery rated important for San Joaquin Valley

BAKERSFIELD.—Deeper drilling around old known structures has given central San Joaquin Valley another deep discovery—possibly one of the most important scored in the area in recent years.

Shell Oil Co. 1 Posuncula on the north edge of the Strand field, 12 miles west of here, is the latest discovery. On a 12-hour test it rated an initial production of 1,810 bbl. of 33.5° gravity crude daily. Flow was through a 28/64-in. choke. Gas-oil ratio was about 700 cu. ft. per barrel.

The new pay is an upper Vedder sand, lower Miocene age, at a depth of 12,360-12,410 ft. Nearest Vedder production is at the Greeley field 5 miles north. These sands have been prolific producers there and at neighboring Rio Bravo.

The Posuncula well was unsuccessful in the Eocene. Shell has not released data as to tests conducted below the Vedder. It is believed the underlying Eocene was found thinned out and nonproductive. The well was bottomed in basement rocks at 14,224 ft. Seven-inch casing was set at 13,028 ft. before plugging back to 12,737 ft. for completion.

In addition to the deep pay, a formation test last February indicated 30° gravity crude production at 9,500 ft. This potential discovery is in a basal Stevens sand, Middle Miocene. Established production in the 16-year-old, 17-well field is from upper Stevens sands at depths of about 8,500 ft.

Extent of production is of course to be determined, but an earlier dry hole indicates best prospects may be to the northwest. Tide Water Associated Oil Co. jointly with Continental Oil Co. in the late forties drilled a 12,818-ft. test about ½ mile southeast of the discovery. It found the Vedder structurally lower and wet.

Tanker Terminal Operated Completely by Automation

Union Oil Co. uses electrically operated valves in the loading lines to handle all bulk cargo at its new $5,000,000 tanker and barge loading terminal at its Oleum, Calif., refinery. The terminal can handle two large tankers and five barges at the same time. A 1,680-ft. causeway connects the steel and reinforced concrete structure to the shore.

THIS WILDCAT overlooks the Mediterranean Sea from heights behind the town of Sciacca on the southwestern coast of Sicily, where voters last week decided against nationalization of the oil industry. Both government and private companies are now carrying on exploration work on the island. This well is being drilled by Azienda Generale Italiana Petroli (AGIP), a subsidiary of a government agency, Ente Nazionale Idrocarburi (ENI).

Oil Policy Upheld

Voters in Sicily reject bid by left-wingers to throw out foreign oil companies; middle-road government retained

VOTERS in Sicily last week rejected a left-wing bid for control of the island's government and nationalization of the foreign oil industry.

Results of the balloting gave Prime Minister Mario Scelba's party, the middle-of-the-road Christian Democrats, 37 seats in the Sicilian Assembly. This is a gain of seven seats.

The Communists and other extreme-left groups were held to 30 seats. The gain by Scelba's party was largely at the expense of the smaller rightist parties.

What it means . . . The outcome of the election was a distinct victory for the moderate elements who had campaigned on the record of the existing government and the present policy of encouraging private oil operations.

The Communists drummed heavily on the slogan, "Sicilian oil for the Sicilians," a phrase similar to that used by antiforeign groups in Brazil for years. During the campaign. the Sicilian Communists exhorted voters to elect their candidates with the promise they would throw out the foreign oil companies and nationalize the industry.

Though a part of Italy, Sicily has a semiautonomous government which the Christian Democrats have controlled since 1946. It was under the Christian Democrat leadership that the 1950 oil law was passed. This opened the island to participation by private capital, foreign as well as Italian.

Oil history . . . Gulf Oil Corp. moved into Sicily shortly after the 1950 law was enacted. Through its subsidiary, American International Fuel & Petroleum Co., Gulf discovered Ragusa field in the southwestern part of the island in 1953. The left-wing faction last year waged a vigorous fight against the issuance of an exploitation concession, despite the fact it was provided for in the law.

Ragusa field now has four producers, and a fifth well has been successfully tested. Producing depths range around 6,500 ft. Plans call for 15 more wells to be drilled in the field by the end of 1956. On the basis of present production, these additional completions would bring total output to 18,000 bbl. daily.

Much of the work in Sicily is still in the exploratory state. British Petroleum Co., Ltd., made a heavy-oil discovery last summer about 28 miles west of Ragusa, and is continuing the search elsewhere. Standard Oil Co. (N. J.), has an interest in several concessions and is about to begin drilling.

Contrast to Italy . . . In contrast to the situation in Sicily, the Italian mainland remains unattractive to foreign oil operators because of the continued failure of the Italian Government to modify the 1926 mining law.

A committee of the Italian Parliament has been studying changes in this legislation, but little progress has been made.

Gulf, in partnership with the Italian Montecatini Mining & Chemical Co., made a discovery earlier this year at Pescara across the peninsula from Rome. The two wells there are shut in pending action by the government on an exploitation or producing concession.

Peron Urges Action

Argentine Congress balks at new oil concession

PRESIDENT PERON has urged the Argentine Congress to approve without delay the 40-year contract authorizing an oil exploration concession for Standard Oil Co. of California.

Peron reportedly told administration leaders in congress he wanted the agreement ratified early in June. The bill was sent to the congress 7 weeks ago. Despite Peron's recommendation for its approval, the bill was tabled last month. Strong, ultranationalistic groups have put up stiff opposition to the proposal.

Peron said quick ratification was needed so that Argentina "can take immediate advantage of its latent oil resources." Unless the Argentine Congress ratifies the bill by September 30, the contract will lapse.

The bill would approve the first foreign oil concession to be granted by the Argentine Government in nearly 20 years. The agreement with Cia. California Argentina de Petroleo, a subsidiary of California Standard, would grant a concession covering an area of 49,800 square km. (about 11,800 square miles) in the western part of the Territory of Santa Cruz near the Chilean border.

California Standard is committed to spend at least $13,500,000 during the first 4 years, to sell oil for domestic refining at a price 5 per cent under the world market, and to share the usual 50-50 profit split *(The Oil and Gas Journal, May 16, page 139).*

Gas Found in Pakistan

Blowout in Pakistan Petroleum test gives eastern section of country first show, caps several years of exploration

Ray P. Gibson

THE first well ever to find gas in East Pakistan has run into trouble. Gas escaping around the casing in a Pakistan Petroleum, Ltd., wildcat caused several craters in an area 200 to 300 yd. from the rig. Two of the craters caught fire. Several camp buildings burned, and spreading fire halted operations.

The well is the Sylhet No. 1, in the northeastern corner of the country. It found evidence of gas at 7,800 ft., and the company cemented 10¾-in. casing at 7,727 ft. The well blew out 3 days after casing was cemented.

N. M. Khan, provincial chief secretary of East Pakistan, said the color of the burning gas indicated the gas was charged with oil. The area has no oil production.

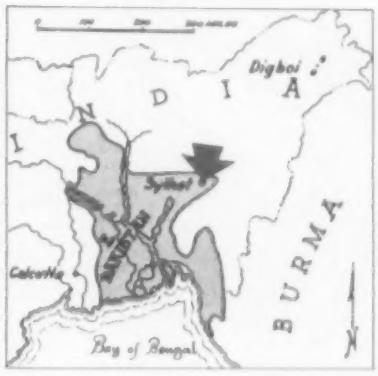
The wildcat is on an anticline at Haripur, 13 miles from Sylhet town. Pakistan Petroleum, a subsidiary of British Burmah Oil Co., made the location on the basis of seismograph studies. The rig, capable of going to 13,000 ft., spudded in on January 27.

The well is located in the Bengal basin some 40 miles west of the abandoned Badarpur oil field in India. The basin has some production in Digboi field of India, about 300 miles to the northeast. Assam Oil Co., another subsidiary of Burmah Oil, produces about 5,400 bbl. daily from Miocene sandstone in this field. Small amounts of crude also are produced in a new field, Nahorkatiya, 20 miles southwest of Digboi. Another comparatively close field is Burmah Oil's Indaw field of west-central Burma. It is not now in production.

Site preparations for the Sylhet well were begun last August. About 80 acres of hilly jungle country were cleared and levelled. An approach road was built during the rainy season. Nineteen bridges along the route had to be strengthened before the rig could be moved.

P.P.L. has explored East Pakistan for several years without previous success. Deep tests at Patheria and Patiya failed to find production.

Other activity . . . One other company, Standard-Vacuum Oil Co., now holds exploration concession in East Pakistan. Standard-Vacuum has about 10,000 sq. miles of area out of East Pakistan's 54,000 sq. miles of territory. The Ganges River delta will be explored.



The company also has a 10,000-sq. mile concession in the Indus River valley of West Pakistan. In addition to the usual 50-50 profit sharing plan between the company and government, the government also has a 25 per cent participation.

Shows of gas also have been found in the Uch area of West Pakistan. A P.P.L. wildcat here found gas at 6,000 ft., but the well will be deepened to 10,000 ft. in search of oil.

In the Sui area of Baluchistan six gas producers have been completed. Gas in a third anticlinal structure in West Pakistan had insufficient pressure to be commercial.

The 348-mile, 16-in. pipeline from Sui to Karachi will begin operation this summer. It is the first long-distance natural-gas carrier in Southeast Asia and the Far East.

Industrial consumers will be supplied at the rate of Rs. 1-14-0 (about 57.6 cents) per M.c.f., while gas will be supplied to the Karachi Electric Supply Corp. at the rate of Rs. 1-12-0 (about 53 cents) per M.c.f.

The possible use of natural gasoline as a motor fuel also is under study. A team of Italian experts will submit a report soon on the possibility of using Sui production for the development of transportation in the country. The report will be submitted to Pakistan Industrial Development Corp.

During the first stage of Sui pipeline operation, an average of about 45 million cubic feet daily will be moved. This volume of gas is equivalent to about 500,000 tons of coal a year, or 42 per cent of Pakistan's annual requirements. P.P.L.'s field is believed capable of producing about 100 million cubic feet daily.

Oil Law Revised

Guatemalan plan would encourage foreign firms

THE Guatemalan Government has announced it is revising the earlier draft of its proposed petroleum law.

This may be another step closer to opening the country to exploration and development by foreign oil companies. The earlier draft, made public last fall, seemed to meet with a cool reception from interested companies.

"Quite nationalistic," was the description of one observer. Concessions were limited to Guatemalan nationals and to companies organized in Guatemala having boards of directors with at least one-third nationals. Furthermore, Guatemalan companies taking concessions were required to offer at least 30 per cent of initial capital publicly in the country.

Presumably, the revisions in the proposed law will make investments in Guatemala more attractive.

The new president, 40-year-old Carlos Castillo Armas, is anxious to boost the domestic economy with large-scale exploration investments and possible oil production in the future. He already has authorized preliminary exploration work on a nonexclusive basis. He also has repealed restrictive legislation of the ousted Red-rigged administration of President Jacobo Arbejo Arbenz Guzman.

Provisions of the proposed law, drafted with the help of U.S. and Latin American experts, include:

. . . Exclusive 6-year exploration rights with a 2-year extension provided drilling is under way.

. . . Conditions that a company may hold as many as 10 concessions of from 5,000 hectares (about 12,400 acres) to 25,000 hectares (about 62,000 acres).

. . . A provision that half the exploration concession can be exploited for 40 years, with a possible extension of 20 years.

. . . One person or company may hold up to 15 exploration areas under joint ownership.

Companies interested in Guatemala include: Standard Oil Co. (N. J.), Richmond Oil Co. (Standard Oil of California), The Texas Co., Conorada Petroleum Corp. (Continental Oil Co., Ohio Oil Co., and Amerada Petroleum Corp.), Union Oil Co., and Houston Oil Co. of Texas. Operators from the southwest, including Clint Murchison interests, have looked into the situation.

Guatemala has been closed to foreign oil companies since 1949 when left-wing elements put through a highly restrictive law *(The Oil and Gas Journal, December 20, 1954, page 74).*

India's Oil Future Dim

Government-sponsored amendment to constitution raises doubts about security of private ownership of property

A GOVERNMENT - SPONSORED amendment to India's constitution has raised doubts about the future of foreign oil interests in the country.

Despite Prime Minister Jawaharlal Nehru's statement that plans for a socialistic economy would not "nibble into the sector of private enterprise," the amendment may have a direct bearing on oil companies.

The amendment specifically cites "searching for or winning mineral oils" as one of the areas over which the state should exert complete "control." This would be done by means of "the extinguishment of modification of any rights accruing by virtue of any agreement, lease, or license" which the government may have granted.

Implications of the modified constitution were discussed in the annual report of Burmah Oil Co., Ltd. It is becoming increasingly difficult to be sure just how welcome private enterprise is in the India of today, the report said.

On the one hand, high government officials have declared that foreign capital will be admissible and is necessary to India's industrial development. Recent legislation, however, gives another impression.

Provision . . . The amendment removes the right to challenge the adequacy of compensation in the event property is acquired by the state. The amount of compensation for private property is to be decided by the legislature. Owners have no recourse at court.

The report added that the Indian Government has given its assurance it does not intend to use its power to expropriate foreign capital and damage international relations and credit.

In the past, the government has always been as good as its word, "but governments change, and this wide power and the removal of the protection of the courts are now written into the constitution," the report said.

Foreign oil operators . . . Foreign oil interests in India included two completed refineries and one under construction. The jointly owned Burmah-Shell refinery in Bombay has a capacity of 40,000 bbl. daily, while the Standard-Vacuum refinery in Bombay is rated at 27,800 bbl. daily. Caltex is building a 10,000-bbl. daily refinery on the east coast. These plants were designed to handle imported crude.

Assam Oil Co., Ltd., a B.O.C. subsidiary, has an integrated operation in northeast India where it operates the Digboi fields. Stanvac has an exploration concession in Bengal basin in 75-25 partnership with the government. The concession covers about 10,000 sq. miles.

B.O.C. activities . . . In discussing B.O.C. activities in 1954, the report said that throughput in the 5,900-bbl. Digboi refinery had increased 50 per cent. Drilling results at Nahorkatiya field, discovered in 1953, indicated that the structure is complicated geologically. Further drilling is necessary before reserves can be estimated, but results are encouraging. As a result of surveys, B.O.C.'s subsidiary has applied for new exploration rights in the upper Assam Valley.

In Burma last year, B.O.C. began rebuilding the Syriam refinery, 4 miles south of Rangoon. Output from this refinery, together with the output of the 3,000-bbl. topping plant at Chauk field, will make Burma self-sufficient for most petroleum products. The report also said that an improvement in security conditions in Burma may permit resumption of geophysical surveying in the Irrawaddy Delta area. The country has been in a state of near civil war since independence was gained from Britain in 1947.

Brazil Policy Hit

Trade executive criticizes government oil monopoly

BRAZIL'S controversial state-monopoly petroleum policy has come under its strongest attack in several months.

Rui Gomes de Almeida, new president of the Rio Commercial Association, leveled the blast in his acceptance speech. He said it is "impossible for the Brazilian Government to supply the national government petroleum monopoly (Petrobras) the foreign money it needs rapidly to carry out the petroleum development plan which is vital to Brazil's existence."

Gomes pointed out national and international policies of today are very different than those of 1930. He declared the economic nationalism of the early years of the administration of the late President Vargas was a reaction to colonial characteristics of the Brazilian economy before 1930.

Gomes added it "is simply ridiculous to impede, at these levels, the entry of foreign capital—through private companies—in the field of petroleum, alleging that it represents a danger to national sovereignty."

The most recent attempt to modify the present oil law was made last winter. A bill was introduced in the Brazilian Senate that would have permitted exploration and development by Brazilian nationals or companies organized under special arrangements. The bill was defeated 32 to 5.

End of 400-Mile Float Trip

This 140-ft. distillation column is eased onto dry land after a 400-mile haul from London to Grangemouth, Scotland, where it is to be installed in the styrene-monomer plant of Forth Chemicals, Ltd. The 85-ton column was made water tight and towed by tug through the North Sea and up the Firth of Forth. The Forth Chemicals plant is located on the south side of the Forth estuary. It obtains benzene and ethylene, basic raw materials, from the adjoining plant of British Petroleum Chemicals, Ltd. (British Petroleum Co., Ltd., and the Distillers Co., Ltd.). Monsanto Chemicals, Ltd., has a third interest in Forth Chemicals.

... BEGINNING.. A SPECIAL SECTION ON TEXAS ....

"Getting close to contract depth," said the driller, pointing to the dial which showed a depth of 31,327 ft.

We call it

TEXAS TODAY

. . . but first—

A prophetic look at

TEXAS TOMORROW . . .

Texas Oil in 1980

"When I dipt into the future far as human eye could see, Saw a vision there of Texas and the wonder that would be" —

with apologies to Tennyson.

by Henry D. Ralph

"OUR allowable's been cut again!"

Jim Blackburn lifted the facsimile message off the receiving instrument and rushed into the office of his uncle, J. Q. Blackburn, president of Blackburn Oil Co.

"I was afraid of that," said J. Q. as he heard the news. "It's those blasted imports. The major companies are going to put us Texas independents out of business if we can't find some way to cut down imports."

He took the message from his nephew and started to read:

"Washington, D. C., June 16, 1980. —The Atomic Energy Commission today reduced allowables of uranium producers an average of 5 per cent.

"Texas producers will be allowed only 17 producing days during July 1980, compared with 18 days in June and an average of 19 days during the year 1979.

"The AEC explained that this reduction was required by the seasonal decrease in market demand for uranium fuel, high inventories as reported by the Bureau of Mines, and the need to maintain good conservation practices and the avoidance of physical and economic waste in the production of uraninum.

"Stripper mines and unitized secondary-recovery uranium projects will be exempt from the shutdown days."

J. Q. slammed it down with an oath.

"This is where I came in," he said. "This is oil all over again. Back in the 1950's, when I was just starting here with your grandfather's company, it was the same story with the oil end of the business—which, of course, was all we had then. Our oil allowable was cut back month after month because of excessive imports."

"... we'll have to put the whole reservoir on MER right away in order to keep the unit's production up to our quota."

"What?" asked Jim incredulously. "You mean to say there was too much oil?"

"Too much oil? Why, we used to have oil running out of our ears.

"Back around 1955—that was the year you were born, wasn't it—Texas had around a million barrels a day of excess production—shut in for lack of a market. And in those days we used to recover only about 50 per cent of the oil in place in a reservoir. New reserves and producing capacity were being developed all over the world so fast that we couldn't see how we were ever going to find markets for all our oil."

"Gosh. Tell me about it, J.Q."

"Well, you know the Blackburn Oil Co. has been in the oil business for 50 years and started producing uranium about 20 years ago more or less by accident because some uranium was found on one of our leases. Oil is still the backbone of our business, but oil doesn't have the growth potential that uranium has.

"Where petroleum used to supply two-thirds of the nation's energy requirements, now it supplies only about one-fourth.

"Natural petroleum is so scare and expensive, and is so valuable for its chemical constituents, that it's being displaced for all power generation except in mobile units—and synthetic fuels from coal and shale are taking over the bulk of those markets.

"But there are so many specialty uses for highly refined petroleum products for which there aren't any substitutes that it pays us to get every barrel of oil out of the ground that we can by any possible method.

"Now back in 1955 it was just the other way around. Oil was so plentiful and so cheap that . . ."

The office intercom television flashed on and brought the face and voice of the operating vice president.

"J. Q.," he said, "the United Nations Energy Resources Commission has decided it can't allocate the United States any higher imports of foreign oil than we brought in during 1979 because of the big increase in demands for consumption in Asia and Africa.

"That means that our Interstate Oil Compact Commission will be putting strong pressure on Texas to increase its production quota during the last half of 1980.

"So no doubt the Texas Railroad Commission will soon be on our tail to get maximum efficient recovery from our Horsehide unit as soon as possible. Our joint operators in the unit will have to go along, although some of them would rather hold the oil in the reservoir for a few years and defer immediate earnings.

"If the Blackburn 97-M Horsehide well hits the new deep pay as calculated, we'll have to put the whole reservoir on MER right away in order to keep the unit's production up to quota.

"The driller says he'll be down to contract depth in about half an hour. Do you think one of us ought to be on the well at that time so we can make an immediate decision on completion and production methods?"

"I think so," said J. Q. "I'll go myself. Right away."

He flicked off the TV and said to Jim:

"Come on out to the well with me. It's part of breaking you into the business. We can talk on the way."

On the roof of the building they stepped into one of the company's jet helicopters. J. Q. set the course on the instruments, pushed a button, and sat back while the 'copter rose and headed off toward West Texas.

"First let's take a look at that new well on the Horsehide Unit," said J. Q. "The rig's been on location a week and they ought to be down to 30,000 ft. about now.

"Not like the old days. Why, back in 1950, when I first went with the company, there were no wells in Texas more than 15,000 ft. deep.

"Of course, we only had rotary drilling in those days, and 20,000 ft. was about the limit of a rotary rig. Even so there were an awful lot of headaches. What a crude apparatus that was. Ever see a rotary rig?

"I saw a model of one in the historical museum at the university," said Jim. "I don't see how it ever worked."

"It didn't work—the crew had to work it. We got the bit down one way or another, but it took a lot of doing.

"Just imagine all those tons of metal at the top of the hole, and those inefficient old piston engines turning out a pitifully small amount of horsepower for all their size. And then transmitting the power mechanically through a rotating shaft 3 or 4 miles long. All that just to turn a tiny rock bit round and round and gradually chew through the formation.

"Steel was all we had in those days, and even with the best steels the bits wore out fast. To change bits we had to bring all those miles of pipe out of the hole, joint by joint.

"Then the drill pipe would twist off and we'd have to fish for it mechanically."

"What happened to the rock displaced by the bit?" asked Jim.

"We pumped it up to the surface with mud."

"Mud? what's mud? You mean—just plain mud?"

"Essentially. But we got to using various kinds of heavy fluids, building them up with weighting materials and chemical additives to serve various purposes. Mud engineering became

a science in itself, and kept getting more complicated all the time.

"You see, Jim, we were still in the Mechanical Age back in 1955. We did wonders with what we had, but those old methods wouldn't get the job done today. Plastics were just in their infancy, and nobody dreamed of using plastic as a well liner. We used to run steel casing all the way to the bottom, joint by joint.

"Well, here we are. Let's land and take a look."

J. Q. set the 'copter down on the windward side of the drilling rig, explaining:

"There might be a little atomic fallout down wind. But here in open country the drillers sometimes get a little careless and don't watch their reaction dampeners and recovery units as closely as they might. Also there might be some hot rock vapor from the condenser vent, though at this depth the heat should be pretty well dissipated in curing the plastic well liner on the way up."

As they walked toward the rig, J. Q. warned:

"Keep away from the 'hot house.' That's where they load the uranium into the bit, you know. Of course it's shielded, but better play safe."

There were no men in sight around the rig, but they went into the air-conditioned control house and met the lone driller.

J. Q. talked with him while Jim studied the banks of instruments and automatic control recorders that showed such things as type of formation penetrated, the permeability and hydrocarbon content of each zone, depth and direction of the bit, pressures, temperatures, radioactivity, and a score of other factors.

Jim knew that there was a duplicate set of recorders in the home office, getting the data by microwave, and that the engineers for all the operators in the Horsehide Unit were watching them and giving instructions to the driller.

"Getting close to contract depth," said the driller, pointing to the dial which showed a depth of 31,327 ft. "I expect word from the office any minute to stop vertical drilling and turn the bit to horizontal for the radial drain holes. From the formation data I figure that the drain laterals ought to be the standard pattern, half a mile or more to the section lines in all directions, but I'll get final instructions from the office.

"She's burning ahead pretty well this tour. Had a little trouble yesterday, though. Hit some awful hard chert at around 20,000 ft., and in order to make hole I had to pull the bit and put in a double-strength uranium cartridge and a thorium trigger. That did the trick, and you should have seen the way the rock vapor came up. It was just about all the condenser could handle.

"... at 20,000 ft. I had to put in a double-strength uranium cartridge and thorium trigger."

"I was afraid that much heat would keep the plastic casing from curing properly, so I kept a close watch on the new automatic formula adjuster, but it worked perfectly. It kept the casing formulation just right for all changes in pressure and temperature.

"Went through a good pay zone about an hour ago—gas-distillate, just as the electronic calculations predicted. Terrific formation pressure. Had to slow the bit down so the casing setter could keep up with it because it had to lay extra thick, extra tough plastic to hold back the pressure. You'll want to dual-complete in that zone as soon as you get permission from the Railroad Commission.

"Of course you'll use a workover U-gun for that little job. We're scheduled to move this rig to a new location 90 miles west on the morning tour tomorrow."

Jim asked the driller:

"Did you ever work on one of those old-fashioned rotary rigs with steel cutting bits?"

"No, son, I'm not that old. These atomic-powered rock disintegrators were pretty well established when I started as a roughneck right after I got my degree in atomic engineering. I've seen some, though. There were a few still being used back then, but only for real shallow stuff—say 10, 12 thousand feet. But darned if those old-fogey professors didn't ask me some questions about rotary drilling when I took my Ph.D. exam."

J. Q. flicked on the intercom television and saw a couple of vice presidents and several engineers in the company control room back home. They conferred back and forth about the progress and results of this well.

"The electronic computer has worked out the hydrocarbon analysis and yield of the new pay zone on the basis of the inferential-log data microwaved from the drilling rig," said the operating vice president.

"Looks as if we'll have to go to close spacing to get 100 per cent recovery of the oil in that reservoir—maybe as close as one well to the square mile. That's going to run the cost up, but I'm sure the Interstate Oil Compact Commission won't let us go to wide spacing unless we can find some other way of getting 100 per cent ultimate recovery.

"We'll put the well on the line right away. The supply-company plane will be there with the wellhead equipment first thing in the morning. I gave the pipeline crew orders to start 10 minutes ago, and they ought to have the line in operation day after tomorrow. After all, it's only 50 miles from the well to the fractionating plant.

"By the way, J. Q., if you stop by the plant, be sure the operator is ready to start running this new production. Of course his automatic recorders have got all the dope we have and the electronic controls should make the proper adjustments for the bigger volume of input and the hydrocarbon analysis, but he ought to check. With these fully automated plants the operators are apt to get lazy. Remind him again of that new directive from the Department of Defense requiring the maximum yield of nonenes."

"Roger, will do," replied J. Q. "And you remind the production superintendent that before he goes away from this well and leaves it on automatic control to be sure that the instrument microwave is properly tuned to the Railroad Commission's computer so the E.B. reports will go through every hour on the hour. The commission's getting a bit huffy because some operators' E.B.'s are a few minutes late."

As they took off in the helicopter, Jim asked his uncle about a plume of smoke rising from the plain.

"In situ combustion," J. Q. explained. "It's an old-fashioned method

of secondary recovery. Didn't you study about that for your degree in energy engineering?"

"A little, but we had to take so many courses in theoretical neucleonics that I didn't have time for many practical courses."

"In situ combustion isn't exactly practical, but it's about all that can be done with certain old fields that were so badly mishandled that 40 or even 50 per cent of the oil was left in the reservoir. That was before we knew how to maintain reservoir pressure and manipulate additive-solvent flood fronts to get 100 per cent recovery. When the pressure went out, the old oil left in the reservoir got viscous and stuck to the sand grains so that it wouldn't flood off. Then the only thing to do was to heat it up by burning some of the oil in place and creating a steam flood. Of course it's wasteful to burn petroleum as a fuel, but in some cases there's no other way to get the remaining oil to the surface."

"But why weren't they getting all the oil out of the reservoirs back in the '50's?"

"Didn't know how, for one thing. Reservoir engineering, the way we know it now, was a relatively new concept.

"Besides, there was no great urge for maximum ultimate recovery. Some theorists were preaching it, and a few of the state conservation commissions were groping toward it. But we had plenty of oil in those days—too much, most of the time—even with our low recoveries. The price was so low—less than $3.00 per barrel—that it didn't always pay to use the newer technological methods of reservoir engineering.

"But the greatest stumbling block was the rule of capture."

"Rule of capture? What's that?"

"That was a medieval legal concept that the courts held onto for years and years after it became obviously silly. The theory was that oil and gas were like wild animals, and if you could entice them onto your property and capture them you could keep them. So every owner of surface property over an oil or gas reservoir wanted to drill as many wells as he could and get as much oil as he could as fast as possible before his neighbors could get it, with very little thought about ultimate maximum recovery and maintenance of reservoir pressure."

"How awful. Weren't there any conservation laws?"

"Some, but they didn't go very far. And some states didn't have any at all worthy of the name."

"Do you actually mean that every surface owner had a right to extract as much oil and gas from under his property as he could, and at any rate he chose?"

"Virtually that. In most parts of the United States the rule of capture more or less prevailed for about 100 years after the start of the oil industry. Oh, there were some restrictions on well spacing, and MER's were being set, in a crude way, in many places, and in special cases there might be an order to reinject gas back into the reservoir."

"But didn't they have unitized operations then?"

"A few. But they were all voluntary. Now and then all the operators in a single pool would get together on a plan for unit operation, but it took a lot of negotiating to do it. After a long period, the value of greater ultimate recovery through unitized application of reservoir control became apparent, but it was many years before the laws and operating practices caught up with technological knowledge."

"But what about the national interest in conservation of an irreplaceable natural resource?"

"Only a few people worried about that in those days. Periodically some government official would get excited about lack of adequate conservation and low reservoir recoveries, but always there were new oil and gas discoveries which flooded the market, and that quieted most apprehension.

"Contributing factors were the tax laws and the methods of doing business then. The tax situation did not encourage people to hold oil in the ground long enough for the slow process of complete drainage of the reservoir. Also, a great percentage of the independent producers in those days operated as individuals, partnerships, or family corporations, and of course their interest was to sell as much oil and gas during their lifetimes as they possibly could. Finally the high rates of personal income taxes forced the business into corporations which have a presumably indefinite life and which can afford to spread their earnings over long periods of years."

Suddenly J. Q. took the 'copter off the automatic pilot and swerved it down and to the right.

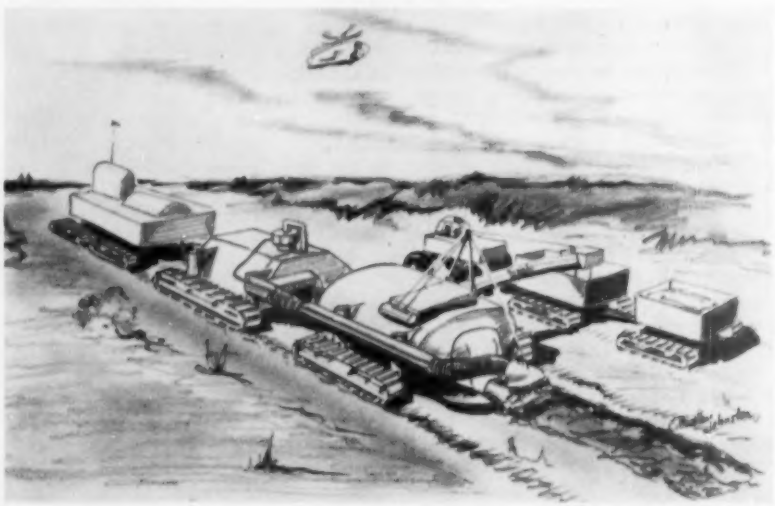
"Let's take a look at this pipeline spread," he said to Jim. "You might be interested in it."

As they hovered back and forth over the slowly moving line of crawler-mounted equipment, J. Q. explained the operation to his nephew.

"That first unit is the pilot, containing the automatic course plotter and radio direction finder. The route was surveyed by air and the exact course was calculated on an electronic computer and then put on a magnetic tape. The tape is in the pilot unit, and the unit gets constant location checks by lorac. Very simple.

"Out here in West Texas they don't need a tree chewer, but in wooded country the chewer goes ahead of the pilot, guided by direction beam, and wades right through any trees, chewing them up into sawdust mulch.

"In rocky country they often have to send the rock-disintegrator unit ahead of the pilot, too, but here, as



". . . the pipe is extruded like toothpaste right in the bottom of the ditch."

you can see, it's following right behind the pilot unit, burning the ditch.

"That very large, articulated unit, of course, is the pipe-making and pipe-laying machine. The plastic and the silicone-glass-fiber reinforcement are formulated and mixed in the forward section—you can see a supply truck refilling the hoppers as they move along together—and then the pipe is extruded like toothpaste right into the bottom of the ditch.

"Apparently the automatic formulation adjusters are working properly, for you'll notice that the newly laid pipe has hardened fast enough for the ditch-filling scraper to follow close behind the layer. That unit on the rear of the filler mulches and grades the entire right-of-way, mixes the soil with fertilizer and antierosion conditioner, and seeds it with fast-sprouting pasture grass. That spread has crossed the entire ranch in a couple of hours and left it in better condition than it was before."

"Is that going to be an oil line?" Jim asked as J. Q. put the 'copter back on course.

"No, it's just a 60-in. sea-water line coming up from the Gulf of Mexico to supply a water-flood operation. This whole area ran out of local water supplies years ago and things began to look bad until the oil industry began bringing in sea water and treating it for human consumption, irrigation, and industrial uses.

"We couldn't have done it with the old-fashioned steel pipe, of course. In addition to the expense, corrosion would have licked the whole scheme. They used to coat the steel with various kinds of plastics inside and outside, but even with cathodic protection the steel would corrode. The development of high-strength, quick-setting, extrudable plastic pipe did away with all that."

"Are we going to visit the uranium operations?" asked Jim.

"Not today. Those boys will be feeling too blue about having their allowable cut again. We can just barely pay out on 17 producing days. If it weren't for the 27½ per cent depletion allowance on uranium production I don't know how we'd exist—and some of those buzzards in Washington want to take that away from us.

"And if we don't stop this flood of imported foreign uranium there won't be any incentives for people to develop new uranium sources."

"Maybe the Government figures that these new solar-energy experiments will do away with the need for atomic power," Jim ventured.

"Well," replied J. Q., "solar energy is a threat to atomic power, all right. It appears to have a big potential, but only for certain limited uses. But they'll have to do a lot more research work to make technological improvements to increase the efficiency and bring down the installation cost.

"Look how long it took atomic energy to take hold. People were talking about its possibilities before middle of the century, but by 1955 there was only one unit in operation—an experimental submarine—and by 1960 there were only a dozen or so small electric generating plants operating on atomic power.

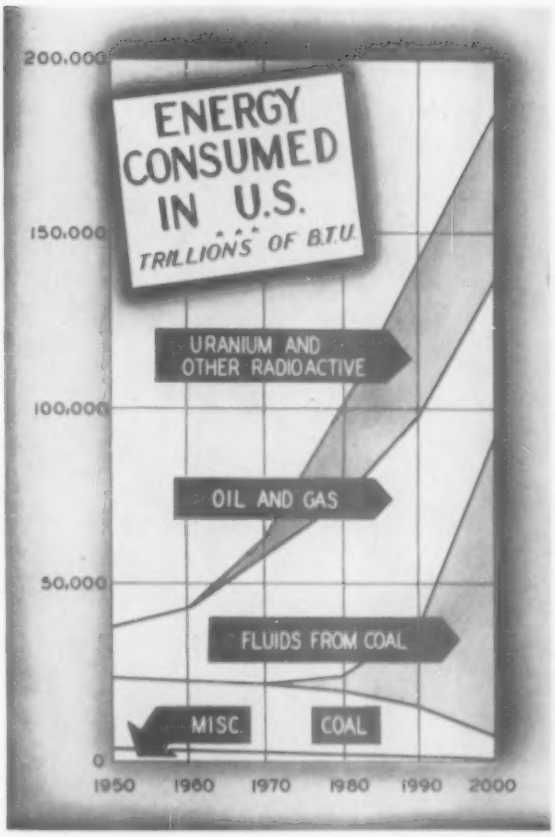
"Even today uranium supplies only about half as much of the nation's energy as petroleum does. But The Oil and Gas Journal's 1980 forecast is that in 20 years—in the year 2000—domestic demand for atomic energy will increase to 50,000 trillion B.t.u.'s a year out of a total energy demand of 150,000 trillion.

"If that happens maybe we'll need all the uranium we can produce in this country, and imports too. But we can't wait 20 years for demand to absorb all the imports at their present rate. An allowable of only 17 days is ruinous."

"Did I understand you to say, back there in the office, that it used to be the same way with oil?" asked Jim.

"That's right. Back in the '50's we had excess domestic producing capacity and imports were coming in at high rates. To keep within market demand, our oil allowables here in Texas were often cut to 16, or 17, or 18 producing days a month.

"We independents raised Cain about



"... even today uranium supplies only about half as much of the nation's energy as petroleum does."

"... be sure that the instrument microwave is properly tuned to the Railroad Commission's computer so the E. B. reports will go through every hour on the hour ..."

". . . we'll have to go to close spacing to get 100 per cent recovery of the oil in that reservoir—maybe as close as one well to the square mile . . ."

the imports of foreign oil, but it was a tough struggle to keep them held down until we finally got the Interstate Oil Compact Commission to set market-demand figures for imports.

"The general feeling was that in 20 or 25 years this country would need all the imports we could bring in plus all the oil that Texas and the rest of the states could produce by any possible method. Of course, that's the way it turned out, but for a long period the surplus just about drowned us. However, it did force a lot of other states to adopt proration systems like Texas', and this paved the way for better conservation and maximum ultimate recovery methods later on when they were vitally needed."

"When did conditions begin to change?'

"Along in the 1960's. Demand for energy had been increasing by an average of around 2 per cent a year for a good many years, but then the percentage increase began to climb rapidly. Oil and gas had a higher percentage rise because they supplied all the increase in total energy consumption in this country for years and years, but along in the middle '60's they couldn't keep up with demand, even though crude-oil production in the United States eventually reached 10,000,000 bbl. per day.

"Then our producibility began to decline while energy demand kept right on climbing. By that time imports weren't so easy to get because per capita consumption of petroleum products had gone up much faster than in the United States, as these other countries brought their industrialization and standard of living up toward our level.

"That's when the push for conservation and maximum recovery really got under way, and we realized that we'd just been fooling around with reservoir engineering before that.

"Also that's when the so-called synthetic fluids from coal and shale began to boom. We always knew—back when I was a boy—that coal and shale would be a source of oil and gas if petroleum ever ran short, but we certainly didn't expect them to pass the output of petroleum as soon as they did."

"I guess utilization was pretty inefficient back in the old days, too, wasn't it?" asked Jim.

"I should say so. Why, tremendous quantities of oil and gas were burned under boilers just to produce steam for power and to heat buildings. Think of that! What a waste of valuable hydrocarbons to get a low yield of usable energy!

"The old internal-combustion engines—gas, gasoline, and diesel—that were almost universally used in those days were very inefficient energy converters, too. Back in 1955 we had a few jet planes—mostly military—and some crude gas turbines were being used in some stationary installations and a few airplanes, but the idea of using turbines in automobiles or tractors was just a gleam in somebody's eye.

"All automobiles used piston engines then. Piston engines were used to power everything—lawnmowers, airplanes, locomotives, tractors—even some electric generators.

"And boy, how those piston engines ate up fuel! Gasoline was the big product then—45 per cent or more of refinery yields. Specifications for gasoline kept getting tougher and tougher, and refiners had to turn more and more valuable hydrocarbon chemicals into motor fuel to be burned up inefficiently by piston engines.

"Of course petrochemical demand took only around 1 per cent of all hydrocarbon production in those days, compared with around 10 per cent today. Petrochemistry was in its infancy in the '50's—just barely getting started."

"Was Texas as big a portion of the oil industry back in those days?" Jim asked.

"Bigger. Along in the '50's Texas accounted for between 40 and 50 per cent of the nation's petroleum reserves and crude production, compared with only about one-third today. It's interesting that this country's total production of crude petroleum was about the same 25 years ago as it is today—around 6,500,000 bbl. per day—but in those days it was rising while now it's declining.

"Some of the newer areas, such as the Rocky Mountain states, found new oil discoveries faster than Texas did. But Texas didn't produce its reserves as fast, and used better conservation and recovery methods, so Texas' relative position didn't slip down very far. And I expect that within a few years Texas will again be producing nearly half of the nation's crude oil. Because their reservoirs were mismanaged in the early stages of production, some of the other areas will never get 100 per cent recovery of the oil, in spite of all the strict regulations of the Interstate Oil Compact Commission."

By this time the helicopter had picked up the landing beam and in a few seconds it settled onto the heliport atop the Blackburn company's building.

J. Q. led Jim to the company library and picked up that week's issue of The Oil and Gas Journal.

"Just glance at this energy-demand chart in the Current Statistics section," he said. "This shows that the 1980 domestic demand is for 90,000 trillion B.t.u.'s. Hydrocarbon fluids from crude petroleum and natural gas are counted on for 25,000 trillion—and we're going to have to hump to make our quota.

"Hydrocarbon fluids from coal and shale will supply 38,000 trillion B.t.u.'s this year. Good old coal will continue to supply 12,000 trillion in solid form—the same as it's done for 50 years. Atomic energy will be up to around 9,000 trillion by the end of 1980, and the other 6,000 trillion will come from miscellaneous energy sources."

While Jim studied the chart, J. Q. pushed a selector button and a microfilm showed up on the reading screen.

"Jim," he said, "if you're interested in ancient history, take a look at this 1955 volume of The Oil and Gas Journal."

"I suppose the Journal was printed from type back in those days," Jim hazarded.

"I suppose so. The printing industry was even more unprogressive than the oil industry back then."

Jim scanned the screen as the pages of the 1955 Journal passed before him.

"Gosh, Uncle J. Q.," he said, "the oil industry certainly was quaint and old-fashioned back in 1955, wasn't it?"

". . . the United Nations Energy Resources Commission has decided that it can't allocate the United States any higher imports of foreign oil . . . That means that our Interstate Oil Compact Commission will be putting strong pressure on Texas to increase its production quota . . ."

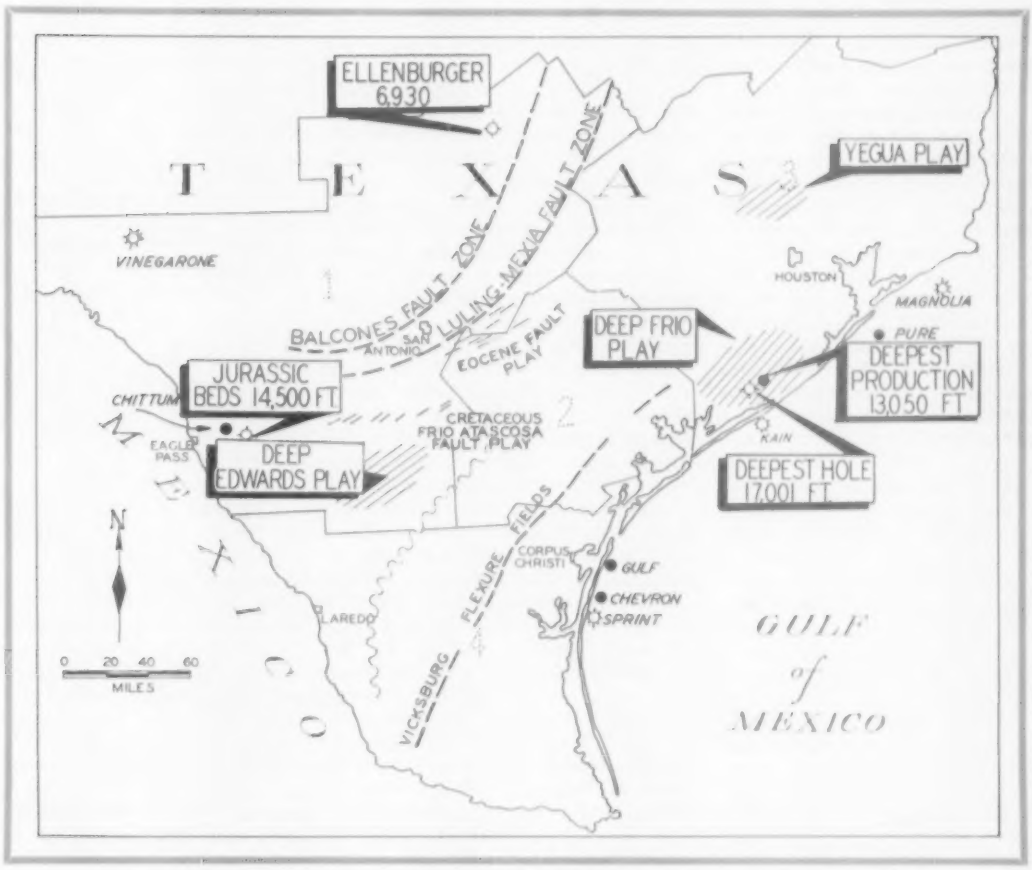


Fig. 1—Regional map of South Texas and Texas Gulf Coast shows concentration of 1955 exploration plays.

Texas' oil future assured by

New Horizons in Exploration

Texas offers wide vistas for future oil hunting: offshore fields, deeper drilling, new pay zones, and stratigraphic plays promise another 50 years of profitable wildcatting

by Frank J. Gardner and Norman S. Morrisey

TEXAS TODAY

AFTER half a century of production, Texas still sets a fast pace in wildcat exploration. The discoveries made during the past 57 years have ranged far and wide over the state, and one would think that by now all the prospective territory must be drilled up.

Not so . . . the big state still offers wide vistas of virgin and semivirgin territory. These, combined with the new horizons opened to the drill by advanced techniques in exploration, drilling, and completion methods, point to yet another 50 years of fruitful wildcatting ahead for the Texas oil hunter.

Hindsight, moreover, is providing new thoughts, new conceptions, and new theories of oil accumulation in even the oldest of Texas' oil areas. These can lead in only one direction—new fields and new pays. This assures the state of a continued position at the head of the exploration parade.

Another vastly important exploration horizon for Texas lies in the tidelands. It is believed that as much undiscovered oil lies offshore as has been found to date onshore along the coastline. Not until 1954 were these submerged reserves tapped for the first time, but now at least six fields are on production out in the water. This lends significant encouragement to the web-footed wildcatter in Texas. For a long while, Louisiana has been far advanced

in offshore exploration and production, while Texas lagged behind, but future months will see rapid progress off the coast of the Lone Star State.

The promise of Texas at present has only two limiting factors: how deep can man drill a hole into the earth? . . . and what is the deepest water in which he will be able to drill? A minimum of 40,000 ft. of sediments is considered to be potentially oil-bearing in the Gulf Coast basin. The Continental Shelf may offer oil prospects out to water depths of 100 fathoms, but current thinking limits favorable areas to depths of 20 to 30 fathoms. With time, this limit may be expanded beyond our present beliefs to revise all our present estimates of offshore reserves.

Let's take a look now at what is going on in Texas exploration, statewide. You'll see concrete evidence of new horizons in the Texas oil search.

South Texas

Variety has always been the attraction of South Texas (here named to include Railroad Commission Districts 1, 2, and 4) for the wildcatter. He can play the shallow shoreline trends, the deep salt-dome basin, the expensive offshore belt, or the inexpensive fault-line trends. He can look for every known type of oil trap in the book. He can base his operations on surface geology, subsurface geology, seismic shooting, magnetometer readings, gravity-meter surveys, or the time-honored methods of trend play and "creek-ology." No oil province known can offer such diversity to the oil hunter as this sprawling southwestern country.

Fault line leads play . . . At the moment, the fault prospects along the Luling-Mexia-Talco fault zone are attracting more activity than any other part of South Texas. In Frio and Atascosa counties, independents and majors alike are exploiting the shallow Upper Cretaceous sand and chalk pays in small closures against en echelon fault patterns; these pays, Navarro and Austin in age, have yielded numerous new fields at depths of 4,600-5,000 ft. during late 1954 and the first quarter of 1955. To the northeast, a second exploratory flurry has centered about the shallower sand pays of lower Eocene age (Wilcox and Midway); these occur in small closures, at depths of 2,800 to 3,000 ft. again along the Luling-Mexia-Talco fault trend. The play centers in Bexar, Wilson, and Guadalupe counties.

This fault-line activity accounts for a notable lead in well completions in Railroad Commission District 1 over the other two districts of South Texas. During the first quarter of 1955, this district alone accounted for 111 wildcats and 310 development wells, or about 45 per cent of all South Texas activity.

Rio Grande embayment . . . Two noteworthy plays have developed within the confines of the Rio Grande embayment. In its upper reaches, a recent discovery by Continental Oil Co. gave Maverick County its first commercial oil well at the 1 N. J. Chittim, on the expansive Chittim ranch. This is one of the old prospective areas of Southwest Texas which has laid dormant, exploration-wise, for nearly two decades. The strike, good on final completion for 103 bbl. per day, on 6/64-in. choke, flowed from the Upper Cretaceous (Austin-Eagle Ford) at 3,109-4,134 ft. It should draw merited attention to this remote part of the embayment.

The second play that attracts notice today in South Texas is the coastward movement of the Lower Cretaceous-Edwards play. In LaSalle and McMullen counties, two recent discoveries have flowed gas and distillate from the Edwards at 10,000 ft. or more to point an exploratory finger at the possibilities of South Texas' downdip Mesozoic province. These represent the southernmost discoveries of Edwards production, as well as the farthest coastward. Shell Oil Co. already has penetrated the Jurassic in southwestern Zavalla County at 14,500 ft., and when drilling equipment permits, oil hunters believe the Lower Cretaceous and Jurassic rocks may hold promise to 25,000 ft. or more in the Rio Grande embayment.

Other areas routine . . . Elsewhere in South Texas, exploration follows a set pattern of discovery by seismic and subsurface methods. Operators continue to open new fields along the old Mirando shoreline trend, and in the near-coastal counties. Among the latter, the north Lavaca Bay area on the Jackson-Calhoun county line has been especially fruitful, with three fields discovered there since the first of the year.

Far to the west, in Val Verde County, but still considered a part of Southwest Texas, Phillips Petroleum Co. has made an interesting Strawn-Pennsylvanian discovery at its 1-A Cauthorn, 5 miles southwest of the Vinegarone Strawn gas field discovered in 1951. This strike flowed 42 million cubic feet of gas and 42 bbl. of distillate per day from perforations at two levels between 9,982 and 10,262 ft. It confirms operators' hopes that the southern rim of the Permian basin in Southwest Texas can be made to give up prolific flows of oil and gas.

In 1954, in Williamson County (District 1), an important dry hole drilled by Shell Oil Co. at its 1 Purcell created excitement by reporting shows of oil and gas in the Ellenburger between 6,950 and 7,400 ft. after topping that formation at 6,930 ft. This is the first time the Ellenburger has been found so far east and south, and the failure indicates a possible new horizon for some South Texas counties in years to come.

Gulf Coast

The general approach to exploration in the Texas Gulf Coast (Railroad Commission District 3) today is in a search for deeper pays, new flank sands, and new fault blocks on the older producing structures. New fields continue to be found through subsurface and seismic study, but the bulk of discovery falls in the "new pay" category. Operators concentrate also on reexamination of old failures, and not a few old dry holes have been reworked to produce oil or gas. New knowledge, new interpretations, and new completion methods can convert many an old failure into a producer in years to come. Long-known salt domes that have never responded with production are falling one by one into the oil or gas column as operators learn more about the mechanics, regional effects, and faulting patterns of the salt dome.

The Gulf Coast play can only be described by one word—DEEP. The search is widespread over 29 counties, and records fall as the bit goes ever farther into the earth. In late 1954, the producing depth record was broken as Stanolind Oil & Gas Co. completed its 1 Sanborn in southeastern Matagorda County in Frio sand at 13,032-52 ft., after reaching total depth of 16,120 ft.

A 10-year drilling-depth record fell when Magnolia Petroleum Co. carried its 1 LeTulle in southern Matagorda County to total depth of 17,001 ft. and abandoned it in Frio at that level (previously, the Gulf Coast depth record was held by Phillips at Millican

"The promise of Texas at present has only two limiting factors: how deep can man drill a hole into the earth? . . . and what is the deepest water in which he will be able to drill?"

dome, Brazos County, with total depth in Wilcox at 16,655 ft.).

During the first quarter of 1955, Gulf Coast operators have uncovered 6 new oil fields, 5 new gas fields, 17 new oil pays, and 10 new gas pays in established fields.

The future of the Gulf Coast onshore would appear to lie in the direction of present effort to find new deeper sands. How deep? As deep as the drill can be made to reach.

Offshore

Texas' greatest future oil potential lies off her coastline. It is too early to make predictions about what might develop there, and for a time the outlook was discouraging, but events of the past 2 years have verified earlier optimistic forecasts. It is generally accepted thinking now that the offshore structures will yield nearly as much oil as has been found to date within a 50-mile strip onshore.

In recent years, wildcatting in the bays and inlets all along the Gulf Coast from Orange to Brownsville has uncovered a multitude of good oil and gas fields associated with complexly faulted uplifts. It is reasonable to assume that the same type of structure will be found under coastal waters out to at least 25 fathoms. Marine geophysics has already spotted many of them, and more will be revealed. But the important thing about these offshore discoveries is their productivity. A field that might ordinarily be connected to a pipeline onshore will often prove unprofitable out in the water. Costs of drilling, lifting, processing, and transporting offshore oil will demand greater potentials from pools there, and undoubtedly many small pools that would be profitable onshore will be ignored and abandoned by offshore operators.

At this early stage in offshore exploration, geologists are shooting in the dark, stratigraphically; too few offshore tests had been drilled in the Texas tidelands to give adequate control or sand sequence guides to the subsurface geologists. Geophysics, therefore, has been the vanguard in exploration, and it must be given credit for accomplishments to date.

In July 1954, Standard Oil Co. of Texas opened Texas' first offshore field at Chevron. The discovery well, 53 State Tract 948, made 254 bbl. per day of 40° oil from Frior perforations at 7,760-66 ft. after reaching total depth of 9,980 ft. Standard now has three wells producing at Chevron, all drilled from a single platform, located in 38 ft. of water off Kleberg County. The oil is carried to shore in a submerged pipeline.

Sun Oil Co. gave Texas its second offshore field in December 1954 at its 1-A State Tract 976. This was a gas strike off the coast of Padre Island (Kleberg County), 10 miles south of Chevron field. It rated 9,300,000 cu. ft. per day on open flow from Frio sand at 9,112-39 ft. The well was drilled directionally from surface location on the island. The field has been named Sprint.

The third offshore discovery was made at Kain field, off Matagorda Peninsula, Matagorda County. Again drilling from an onshore location, Shell Oil Co. was the operator. Its 1 State Tract 486 tapped a Miocene sand at 5,189-5,208 ft. for 23,000,000 cu. ft. of gas daily in late December. This strike represented the first instance of reaching out underwater from an established onshore field for offshore oil. In earlier years, a few operators had done the same thing, but without the success attained at Kain.

In February 1955, Gulf Oil Corp. found the fourth offshore field and the second oil pool at its 1 State Block 889, 4 miles east of Mustang Island off Nueces County. This strike, good for 140 bbl. of oil plus 1,400,000 cu. ft. of gas daily, found three potential oil sands ranging in thickness from 21 to 154 ft. and was definitely a stimulant to the Texas offshore campaign.

Number five in the offshore discovery list was Magnolia's gas strike in State Tract 10, 8 miles off Jefferson County in the upper coastal belt. This well made 25,000,000 cu. ft. of gas per day in March. It produces from a Miocene sand at 8,016-30 ft., where it was finished after drilling to a total depth of 13,386 ft.

Most recent offshore discovery was Pure Oil Co. et al 1-A O.C.S. Lease 0109, completed in April for 146 bbl. of 37.1° oil per day from Miocene sand at 7,520-28 ft. Rewarding offshore Texas with its third oil field, the discovery was the first for the upper coastal area.

These six offshore fields represent 1 year's returns to Texas operators in the water. But they are only an indication of things to come. At the moment, eight rigs are running in Texas waters, but it's a safe bet that this number will double by the end of 1955.

East Texas

Late 1954 saw a definite upturn of seismic and drilling activity in this oldest of Texas oil regions. Exploration hopes looked up for the first time in a long time, as two major developments appeared on the scene. The first of these was the emergence of Neches field, on the Anderson-Cherokee coun-

Fig. 2—Smackover strikes are the most significant developments in recent East Texas exploration.

ty line, as a major field with more than 100 million barrels of reserves. Discovered in 1953, the field underwent rapid expansion from only 3 or 4 wells at the first of 1954 to a total of 160 at year's end. Here was an example of a subsurface structure only a short distance east of one of the oldest fields in East Texas—old Boggy Creek salt dome, discovered in 1927. Detailed subsurface work at last located the productive closure that produced a major field. Spurred on by this success, operators took a fresh look at other old East Texas fields and prospects.

East Texas' second important development was the discovery of deep Smackover-Jurassic fields at two widely separated points. In 1954, a well in New Hope field (Franklin County) had been completed in the Smackover at 12,086-12,341 ft. for a whopping 42,500,000 cu. ft. of gas plus 4,800 bbl. daily of distillate. This year, at old Mexia field, Humble Oil & Refining Co. opened a Smackover reservoir at 8,565-76 ft. with a 232-bbl. well. This discovery was 90 miles southwest of the nearest Smackover gas production in Rains County, and it electrified the entire East Texas basin. Recent reports indicate disappointment with the performance of the Humble well, but leasing and exploration took on new life throughout the old fault-line area between Mexia and the Arkansas line. Some reflection of this may be seen in the drilling and completion statistics for Railroad Commission Districts 5 and 6 for this year: 93 wildcats completed during the first quarter (compared to 64 for the same period in 1954).

During 1955, oil has been discovered downflank in two large gas fields—at Minden and at Willow Springs. Production comes from the Pettit and Travis Peak beds at depths below 7,000 ft. East Texas, too, is feeling the impact of DEEP exploration as more and more reservoirs are found in the deeply buried rocks of Lower Cretaceous and Jurassic age.

West Texas

Deep drilling holds the spotlight in West Texas for 1955 as oil companies look for a new Dora Roberts trend. The Ellenburger formation is the main pay zone found at depths ranging from 9,000 to below 14,000 ft. on the flanks of the Central Basin platform. But the Devonian in parts of West Texas has become the primary target.

Shallow drilling took an upswing with the Queen sand production at Means in 1954 and this play is continuing, especially in the Caprock area of New Mexico.

Several recent successes in New Mexico give promise of developing into sizable fields with production from basal Permian, Pennsylvanian, and Devonian rocks.

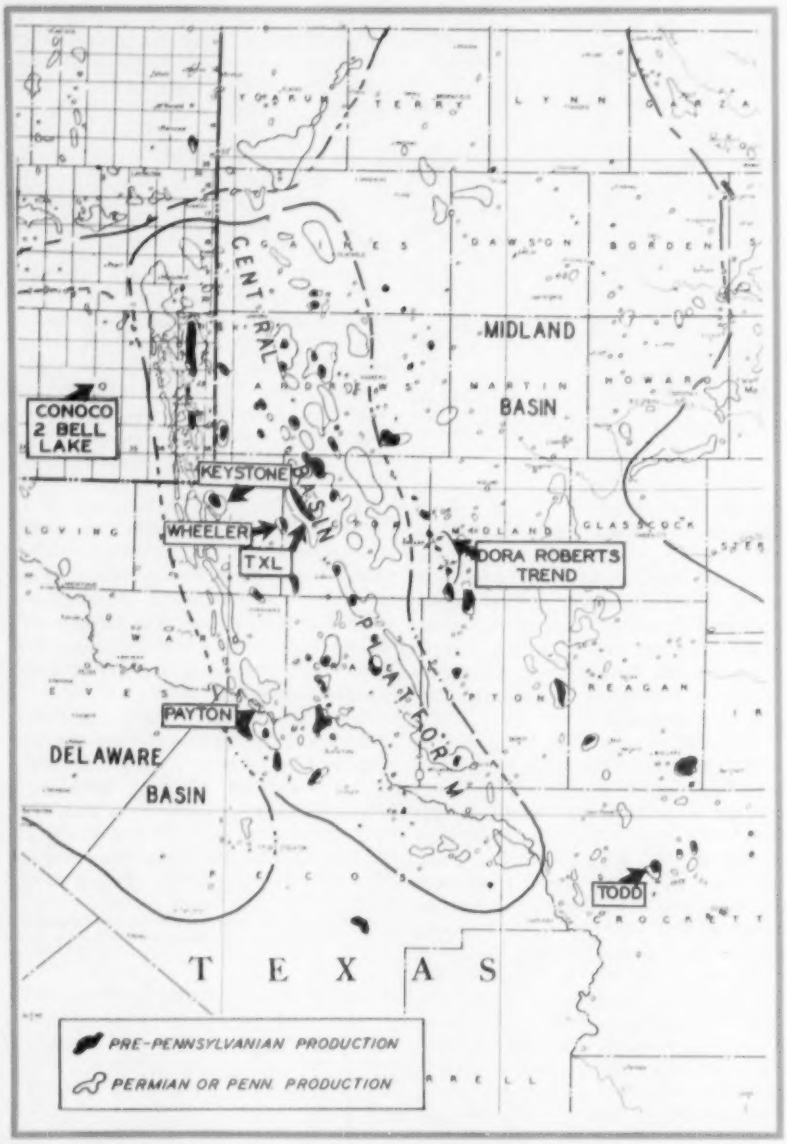


Fig. 3—Fields like Big Mineral make attractive target for exploratory work in Grayson County.

Delaware basin . . . Texas' "last oil frontier" still has excellent prospects of becoming a rich oil province, but to date most of its production comes from the shallower Permian sands rather than from the deeper and potentially more prolific pre-Permian beds. Actually, the next 24 months may tell the story in the Delaware basin. It has only been within the past 2-3 years that it has been possible to use seismic work effectively in the Permian basin. Invariably, deep drilling follows 2-3 years behind the initial exploration; 1955 and 1956 should see the results of the improved seismic work in the form of new discoveries in the Delaware basin.

Present data clearly show that pre-Permian production in the Delaware basin will be from great depths. A test in Reeves County near the center of the basin was abandoned at a total depth of 18,609 ft. still in Mississippian rocks.

Central Basin platform . . . Intensive exploration along the flanks of this uplift paid off handsomely in 1954; and 1955 is witnessing a renewed effort that already has had several key successes. Most of the wildcats are staked on geophysical data although shallow subsurface control helps pin point the seismic prospect.

Thick porous Devonian dolomites occur on the northern end of the Central

Basin uplift, making this area very attractive. Three recent successful and prolific Devonian wildcats in Gaines County emphasize the importance of this reservoir.

Many of the known shallow Permian producing areas harbor deeper structures that will eventually be drilled. Deep Ellenburger production was established in the shallow Payton and North Monahans, and more discoveries similar to these are expected during the next several years.

West-Central Texas . . . Shallow drilling depths and the numerous pay horizons have made West-Central Texas extremely active during the past few years; majors and independents are successfully working in the area. Pennsylvanian sands, the Ellenburger and Cambrian sands all are found above 6,500 ft. in many parts of West-Central Texas; in several fields wells are dually completed, insuring a rapid payout and substantial reserves.

Strawn sand production rejuvenated the Jameson reef field in northwestern Coke County during 1954 and the drilling activity is continuing in 1955. Strawn sands pinch out on the west side of the Jameson reef and are missing over the crest of the structure that was originally discovered in 1946. Strawn sand production was established in 1952 and the producing area has steadily grown. Today Strawn sands at Jameson produce 36,136 bbl. per day. Oil companies anticipate similar sand pinchouts on other reefs in West-Central Texas.

Cambrian sand production that made headlines in 1954 has taken a back seat to the stratigraphic plays and shallower sands. Thus far production has been largely confined to the known trend in Coke, Nolan, and Fisher counties, but there is always the distinct possibly of finding additional Cambrian oil fields in the area.

NORTH TEXAS

Grayson County continues to hold the exploration spotlight in North Texas, a position it has held for several years. Strawn sands, the Oil Creek sand, and the Ellenburger limestone make this area very attractive and 13 successful exploratory tests have been completed in the first 4 months of 1955.

Sandusky field discovered in 1950 touched off an active seismic campaign for Grayson County. Since then the majority of the pre-Pennsylvanian prospects have been located by seismic methods. Much of the Pennsylvanian production is associated with the deeper Ellenburger fields, and is controlled by both structure and stratigraphy. Seismic work has proved to be an effective way of unraveling the complexly faulted trends. The structure at Strawn level does not accurately reflect the deeper pre-Pennsylvanian structure, so that oil companies try to map the deeper horizons if possible.

Sherman field, where 20 rigs are active, is enjoying a boom with the discovery of deeper production from Strawn sands at 7,500 ft. and below.

Some geologists consider that the folding and faulting in Grayson County is an extension of similar trends in Oklahoma, but the two producing areas are separated by a barren strip about 15 miles long. In Grayson County both normal and thrust faulting have been mapped; apparently both types of faults play a key role in controlling oil accumulation. In at least one instance production occurs below a thrust fault.

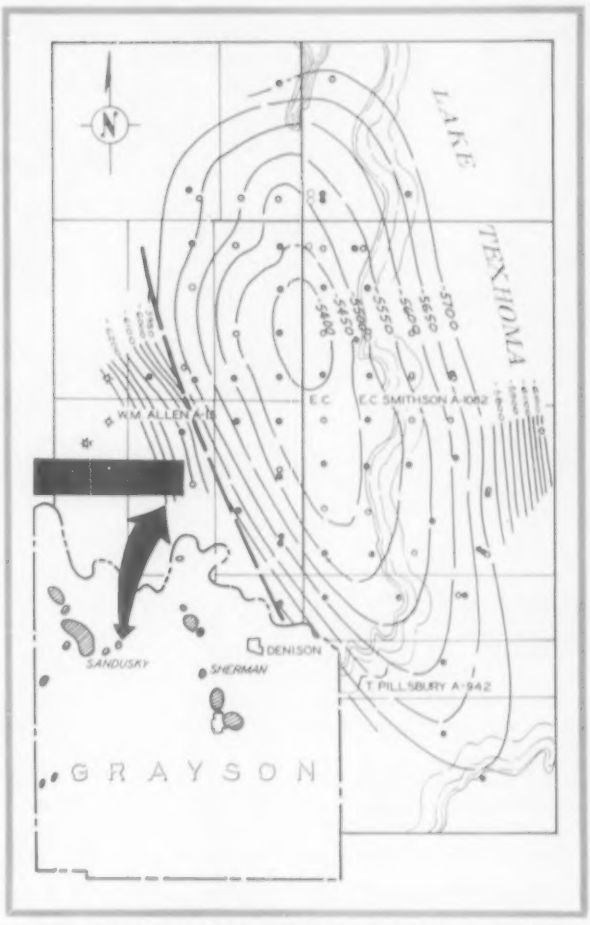


Fig. 4—Several successful Devonian wildcats in Gaines County give promise of becoming significant producing areas.

Big Mineral . . . Drilling at Big Mineral in north central Grayson County has declined, but a successful wildcat might extend this prominent field either to the northwest or the southeast. There is nearly 1,000 ft. of relief across Big Mineral field, caused by both folding and thrust faulting on the southwest flank. Folds such as this often extend for many miles in the subsurface and local closures on the major feature serve to trap the oil.

Bend Arch . . . This part of North Texas enjoys a steady but unspectacular drilling program. In 1954 the shallow drilling made Railroad Commission District 8 the second most active in Texas, surpassed only by West Texas; and much of the District 8 drilling is on the Bend Arch. Principal producing zones are Pennsylvanian sands and are found at depths ranging from a few hundred feet to about 7,000 ft.

The outlook in the Bend arch is for continued development drilling at its present level for the rest of 1955. Exploration uncovers numerous small

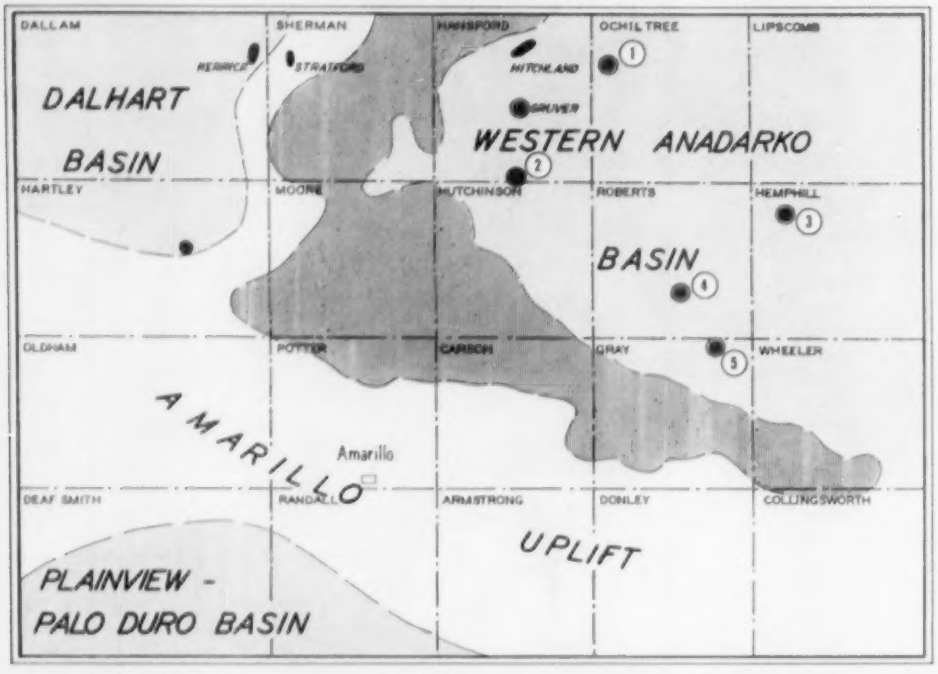


Fig. 5—The pre-Permian possibilities of the Texas Panhandle have barely been scratched.

fields that are rapidly exploited. Although major companies are active, on the Bend arch, much of the shallow drilling is handled by independents.

The Texas Panhandle

One of the hottest oil hunts in the nation is under way in the Texas Panhandle. The objective of the wildcat drill in this vast area is the pre-Permian formations. Most of this exploration is in the western Anadarko basin, north and east of the Permian Hugoton and Panhandle fields. Other development is taking place in the Stratford dome and Dalhart basin areas of far northwestern Texas.

One single discovery off the north flank of the Amarillo Mountains startled the industry earlier this year. It was Phillips Petroleum Co.'s 1 Troy A in Gray County (5 on map). This Laketon area discovery opened first Ellenburger production in the province, more than 140 miles from similar production. This discovery, which was completed for 300 bbl. of oil per day from perforations at 11,220-90 ft., set off a flurry of wildcats and deepened wells. The Ellenburger discovery is in the granite-wash Laketon field, where a second granite-wash pay was recently added. This field is in a complex highly faulted area off the Amarillo uplift. More Ellenburger exploration is slated for the Gray County area this year.

First production was opened in Hemphill County in April at Sun Oil Co. 1 Dale Nix, 2½ miles northwest of Canadian. The discovery well flowed 149 bbl. of oil per day from the Cherokee-Des Moines Pennsylvanian sand. (3 on map). Nearest production is at Lips Ranch field in Roberts County. Offset development wells are planned for this rank discovery area.

Biggest pre-Permian . . . The biggest pre-Permian play is in Hansford County. Pennsylvanian pays have extended new producing areas in all directions in the county. The Tonkawa sand is one of the best new pays in the area.

The third Permian-producing area for the Panhandle was established in January in Roberts County at Cree Drilling Co. 1 Flowers-Shell-Flowers. The gas discovery is 9 miles north of Quinduno field. Production is from the dolomite. (4 on map.)

The Texas Co. confirmed a dual gas discovery in western Ochiltree County at 1 Daniel "C," 8 miles southeast of Waka and ½ mile northeast of the 1 Daniel "A" discovery well. Production is from Atoka and Morrow sands. This successful play in Ochiltree indicates the county possibly has potentialities similar to those in Hansford County. (1 on map.)

The tripay North Hutchinson Penn field in Hutchinson County got its first oil production at The Texas Co. 1 Harbour, 11 miles south of Hansford. Production is from Marmaton lime. (2 on map.)

Prospects bright . . . The outlook for more production from the Panhandle is good, for the area has had few deep tests, compared to other parts of the country. Most of the production is shallow, above 5,000 ft., and the deeper possibilities beckon both majors and independents.

Adverse geological conditions prevented oil companies from successfully exploring the Panhandle until the past few years. Now, however, stimulated by the recent wave of successful wildcats, oil companies are renewing their efforts to find more oil.

The flanks of the buried Amarillo-Wichita uplift make an attractive exploration target for the geologist who can successfuly unravel its complexities. The granite-wash section on the north flank of the Amarillo uplift thickens rapidly offering both structural and stratigraphic plays.

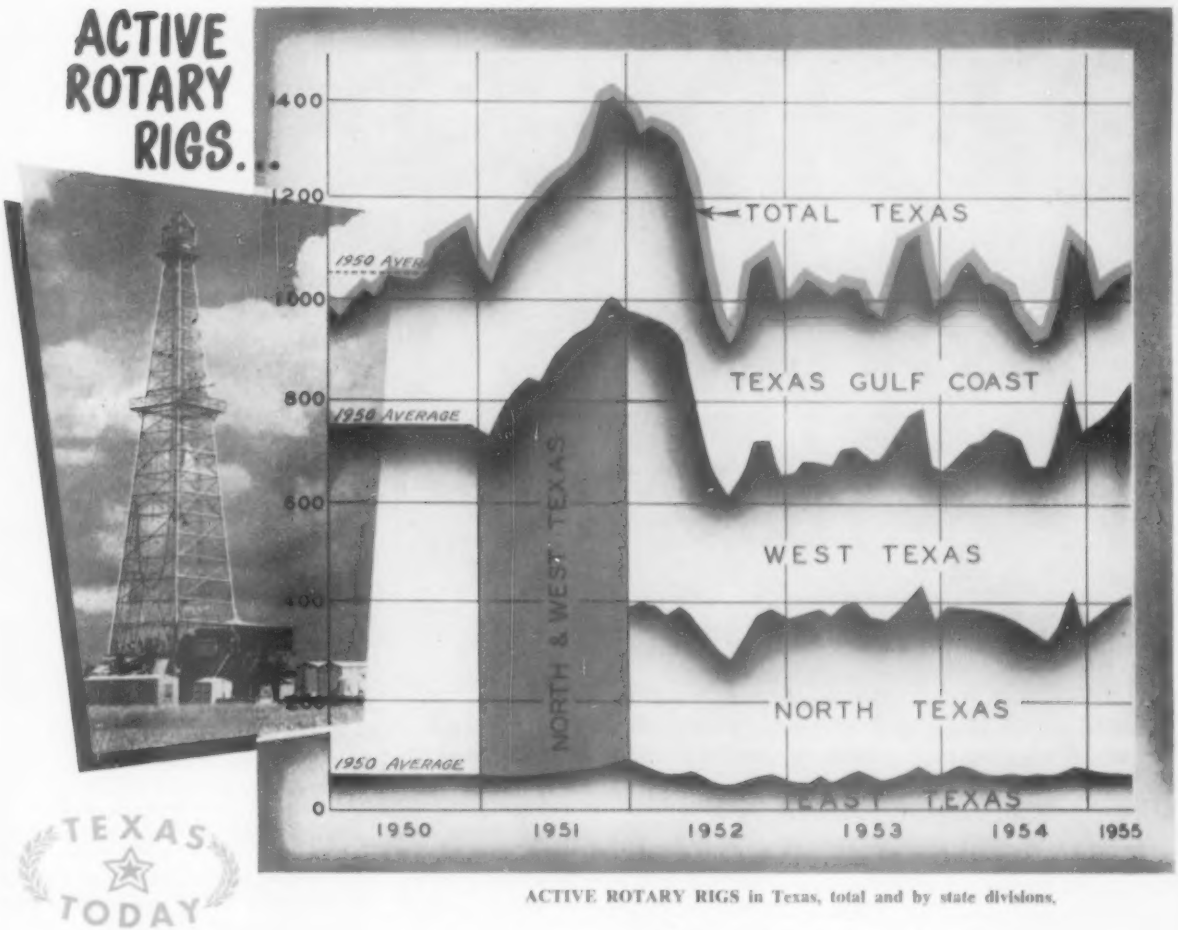
Stratigraphic possibilities apparently increase in the northwestern part of the Panhandle as the geologic section thins approaching the Sierra Grande and Las Animas arches.

South of the uplift, the Permian limestone sections offer promise of production similar to the Anton-Irish pool that has produced over 18 million barrels of oil since its discovery in 1944.

Anadarko basin . . . First deep oil in the Panhandle part of the Anadarko basin was found in 1949 by Sinclair Oil & Gas Co. 1 Lips. Later developments in this field were disappointing but did not deter oil companies from pushing an aggressive search for new reserves. Quinduno gave the area a much needed shot in the arm with production from the brown dolomite (Wolfcamp).

The pre-Permian possibilities of the Anadarko basin are virtually untested. Ellenburger production early in 1955 at Phillips 1 Troy A gives a clue as to what may be expected from this zone.

Already 12 different Pennsylvanian sands produce in the Panhandle, making this section exceptionally inviting. In the Morrow the sands appear to be erratic but productive.



ACTIVE ROTARY RIGS in Texas, total and by state divisions.

Texas Is Undisputed Drilling Champion

- **Its rigs drill twice as many holes as next state**
- **These holes have three times the footage of No. 2**
- **These holes require 1,000 to 1,100 active rotaries**

by Ed McGhee
District Editor

FOUR of every ten rotary rigs drilling in the United States today are in Texas. These rigs drill twice as many wells each year as are drilled in any other state. Moreover, Texas drillers cut three times as much footage per year as the nearest other state.

If the rate of discoveries goes on as it has thus far this year, those rigs will stay in Texas. During the first quarter of 1955, already 230 new oil or gas producers have been made in wildcat wells.

At the height of the Spraberry and Scurry County booms in 1952, as many as 1,400 rotaries were active in the state. However, since that time the number of active rigs has mostly stayed between 1,000 and 1,100. Despite the lower number of rigs running, Texas drillers have managed to drill more wells and more footage each successive year since. In the hard-rock areas, new drilling records for deep wells are being set almost daily. We can certainly expect the number of wells and the footage to be even higher this year.

Texas rigs are doing some of the hardest and some of the easiest drilling on the continent. Some of the deepest and some of the shallowest. Here are the drilling problems and practices in each area.

West Texas

West Texas is hard-rock, tough-drilling country. Much of the current drilling is deep; much of it through crooked-hole formations. Compared to some other sections of the state, contract footage prices are high. In spite of this, drilling times are being constantly improved. The main reasons for the fast drilling are: use of bigger drill collars and higher bit weights; jet bits and chert bits; more use of water as a drill-

TEXAS WELL COMPLETIONS, as compared with total United States completions.

TEXAS TODAY

ing fluid; and better selection and use of drilling equipment.

West Texas has long had the reputation of being the home of the big drill collar. That reputation is better deserved today than ever. Now it is not unusual for a contractor to run twenty-five 6¼-in. collars in 7⅞-in. hole. Sometimes, as many as twenty 7-in. collars are run in 8¾-in. hole. Primarily, of course, the collars are to add more bit weight without raising the number of collars in the string. The higher bit weights—sometimes as high as 70,000 and 80,000 lb. on 7⅞-in. bits—are one of the biggest reasons why West Texas drilling is faster than ever before. Equally important, the bigger, stiffer collars are helping keep the hole straight without sacrificing too much from the penetration rate.

Not all drilling contractors in the area believe in "packed-hole drilling." They argue that the big collars, since they cannot be washed over, are a real fishing hazard. Moreover, there have been several fishing jobs in West Texas where 7-in. collars were washed over in 7⅞-in. hole. The special wash pipe used for these operations must be handled with care because its walls are thin. But it's hard to argue with success. The collars were recovered.

One unexpected result of using the big collars is that bit life is generally longer than with smaller collars. Probably, the longer life is due to the fact that the big collars do not buckle. When a smaller collar buckles under high weight, it makes the bit "walk" around the bottom of the hole. This means that the cones are not loaded evenly—first one carries all the load and then another. Therefore, the bit doesn't last as long as it would otherwise.

The bit question . . . There are as many opinions about jet bits as there are contractors in West Texas. Up to now there has been no conclusive proof to satisfy everyone one way or the other. However, one contractor is now conducting a series of tests with a jet indexing sub. Thus device allows the driller to change a bit from jet operation to conventional operation without removing the drill string from the hole. The idea is to drill a few feet with the jet and then switch to conventional. When this has been done on enough holes, the contractor will be able to say with certainty whether or not the jet bit gave him faster drilling.

With the chert bit it's another matter. Everyone agrees that it can save time, bits, and money. There is still some experimenting to see exactly what type formation is the breakeven point—which formation will drill just as economically with the chert bit as with a rock bit. The main savings with the chert bit is in time—it makes more feet in the harder formation. Therefore, the number of round trips with the drill pipe are fewer.

Drilling with water . . . Ever since the Spindletop drillers drove cattle through their slush pit to make mud, the tendency has been to make the drilling fluid "muddier" as time went on. In West Texas, that trend has been reversed. The contractors and operators, having seen how much faster drilling is with water, are using water whenever they can. In some wells, the drillers don't "mud up" until reaching 10,000 ft. and below.

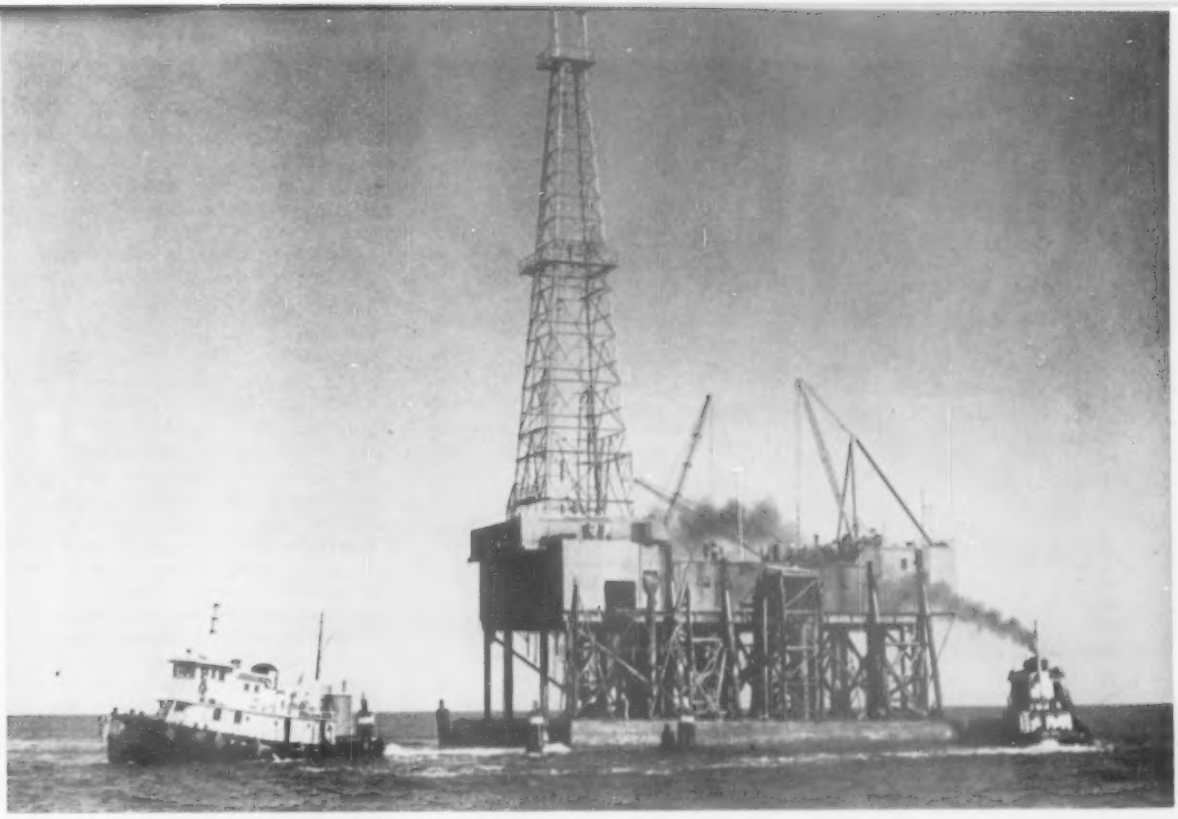
One good example of this is Midland Farms field of Andrews County. One recent well reached a depth of 12,700 ft. in only 56 days. The hole was "mudded up" at 10,500 ft. Wells like this would have required 90 days if drilled a year before.

Also in Midland Farms field, the operator is taking drill-stem tests with water in the hole. No special precautions are taken—the hole is merely circulated long enough to be certain that it is clean. Needless to say, testing with water is a great time and money saving over the old practice to mudding up specifically for the test.

Air drilling looks better . . . For the first time in West Texas drilling, contractors are taking a second look at air drilling. In the past year one contractor has used air as the drilling fluid on footage-contracted wells. He has reported that he made money by doing it. Other contractors are beginning to consider use of air on their own operations to speed up drilling rate and, thereby, meet the tough competition.

As in other areas, water is the main trouble in West Texas air drilling. Fortunately, there are some areas where long sections of the hole can be drilled without penetrating a water-bearing zone. Moreover, there are areas with cavernous formations that would be too costly to drill with anything but air or gas. In cases, formations have been so cavernous that there were no returns of the drilling fluid even while drilling with air.

Some engineers feel that the drilling rig should be fitted with enough air-compressor capacity to drill with air-mud mixtures in any combination. If air alone would do the trick, then no mud would be injected. If there were too much water in the hole for air alone, an air-water mix could be used in any proportion needed. Phillips Petroleum Co. has already found that it can drill faster with an air-mud mix



TEXAS TIDELANDS DRILLING is still in low gear. Only five wells are now drilling in these areas.

than with mud alone. Experiments with this technique were carried on in Glenna pool in Pecos County. Originally, air injection into the mud stream was tried to help overcome loss of circulation. This it did satisfactorily. Phillips found that this mixture, by lightening the mud column, also raised the penetration rates.

Times are a little better . . . From the contractors' point of view, the drilling picture is better than a year ago. Times are not flush, but the price cutting and bidding wells below cost—common a year ago—is letting up. Biggest reason for the improvement is that the number of active rigs is higher than a year ago.

Much of the deep drilling in West Texas is to the Ellenburger lime. Footage prices are about $11 per foot when total depth is below 13,500 ft. When total depth is around 12,500 ft. the bids average $9 to $10 per foot. Drilling engines are rated from 1,000 to 1,200 hp., and 136-ft. steel derricks are used. Day work for this equipment runs to about $1,000 per day with drill pipe.

Drill stem is problem . . . One of the things that makes West Texas drilling more expensive is the short life of drill pipe and drill collars. Corrosion fatigue is the cause. It attacks the threaded parts of tool joints and drill-collar connections. Abrasion by the formations of the outside diameter of the drill pipe and drill collars adds to the problem.

To combat this trouble, the contractors use some kind of inspection regularly on their drill string. They also use hard-banding techniques to check abrasion. Stub-ending of drill collars is standard practice.

Gulf Coast and Southwest

To contractors on the Texas Gulf Coast, making hole is not much of a problem. The formations drill fast, and there is no general tendency to crooked hole. However, there are enough troubles to make up for the fast penetration. Most of the trouble concerns the mud system. In deep wells, the mud bill can easily run 25 per cent of the total well cost.

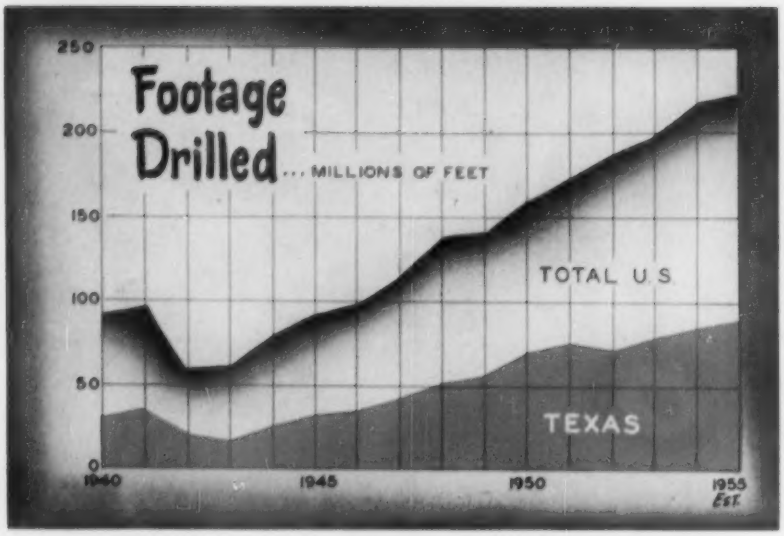
Loss of circulation is frequent. Many drilling men believe that the loss is often due to induced fractures made by the piston effect of running drill pipe into the hole too fast. Spudding the pipe with pumps running and starting pumps too fast causes trouble too. Conventional flake and granular loss-of-circulation materials are sometimes effective, but placing cement is a common remedy.

In deep drilling, pulling the pipe from the hole too fast can be just as bad. If there is a high-pressure gas sand exposed in the hole, the swabbing effect can bring enough gas into the mud column to lighten it dangerously. On many wells there is a dangerous balance in mud weight. If it goes up, circulation is lost. If it goes down, gas comes into the hole. Mud degassers are often necessary.

Centrifuge looks good . . . Several Gulf Coast operators are reporting good results with a centrifuge to maintain a low-solids mud. The centrifuge separates out the drilled solids and keeps the weighting material in the system. The first saving from the centrifuge is that it kills the necessity for "watering back" the mud. Every time mud is watered back, part of it must be discarded. Discarding the heavily weighted and treated mud typical to the Gulf Coast is costly.

Operators and contractors alike are pleased with the low-solids mud. Some say that it helps drill faster and prevents possible hole trouble. The centrifuge seems to be the cheapest way to maintain the low-solids content. It is doubtful that contractors will buy centrifuges as a part of their permanent rig equipment. Since the operator foots the mud bill, he will also have to provide the centrifuge. Since drilling time is just as important to the operator as to the contractor, the operator should be able to justify that expense.

Slim holes talked . . . There's a lot of slim-hole talk on the Gulf Coast. And there have been some slim holes drilled. Many people are still not convinced that the slim hole will be economical. Among the people who are convinced that it can be economical, there are two ideas about how it should be done. The first and oldest school of thought is that the



FOOTAGE DRILLED in Texas, as compared with total United States footage.

slim hole will pay only in exploratory wells where the odds are against setting an oil string.

The second group holds that an exploratory well is the very place where the hole should not be slim. They contend that there is too much danger of being "cased out of the hole" if drilling goes to great depths. There should be plenty of room in the wildcat well to set intermediate casing strings if they become necessary; there should be plenty of room to carry on fishing operations.

This second group says that development wells are the logical choice for slim holes—wells in which the contractor knows exactly what the subsurface conditions are. Two years ago this would have been an impossible stand to defend. Today, however, there are good arguments for this position. Most of the reasons are the new small-diameter tools that have been developed. There are a multitude of perforating, logging, and flow-metering tools that can be run inside 2 and 2½-in. tubing. There is virtually no completion or production operation that cannot be carried on inside a slim hole. Therefore, the Gulf Coast may see more slim holes in the future.

Fast in Southwest too . . . Drilling in the Southwest — Railroad Commission Districts 1 and 4—is much the same as in the Gulf Coast—Districts 2 and 3. One big exception is that locations are generally easier to maneuver. In Big Foot field of Frio County, Shell Oil Co. has set a lot of records for fast, shallow drilling. One well reached total depth of about 3,300 ft. in 15 hours after spudding. Moving from one location to another and rigging up to spud took as little as 4 to 6 hours.

Activity in this area should be up as a result of the recent oil discoveries in Val Verde and Maverick counties wildcats.

North Texas

Fast, easy drilling is the rule rather than the exception in North Texas. Most wells are dug by light rotaries, but there are more cable-tool rigs in this part of the state than any other. Reason for this is that the wells are shallow—most of them about 2,000 ft. There are few problems in drilling to the Cisco, Canyon, and Strawn pays. In the western portion of this area, the salt beds can make trouble. Moreover, makeup water is often contaminated.

The exception to the above is the drilling in Cooke and Grayson counties. There, drilling is deeper, the formations harder, and crooked hole a problem. Multizone oil production ranges from 3,600 to 10,200 ft. The pay formations are steeply dipping Pennsylvanian and Ordovician beds. Because of this 20° to 60° dip, the early wells drilled slowly to keep the hole from deviating too much.

Shell and others adopted the big drill collars common to West Texas. Now, some of the wells drill 7⅞-in. hole with 7-in. drill collars; some of the 8¾-in. holes drill with 7¾-in. collars. Moreover, the operators are beginning to accept more than the usual 3° limit on hole deviation. Some allow the 1° of deviation for each 1,000 ft. of hole.

In the Cooke and Grayson counties drilling, low-water-loss oil-emulsion mud is popular. This mud protects the pay zones from contamination and keeps the hole in good mechanical condition. There has been little mechanical trouble in the holes even with the large collars.

Some are dual producers . . . Since there are many pay zones in each field in the Cooke and Grayson counties drilling, some of the operators are making dual completions. However, other operators are drilling individual wells to drain each reservoir. This, of course, has kept more rigs busy.

Usual practice is to set the oil string to total depth. To cover all of the producing zones, the cement must sometimes rise as high as 5,000 ft. above the casing shoe. Centralizers and scratchers are used, and two-stage cementing is common.

The Panhandle

The Texas Panhandle is one of the hottest exploratory areas in the state.

JOURNAL SURVEY OF TEXAS ROTARY-DRILLING CONTRACTORS

According to the Journal's latest survey, there are 512 rotary-drilling contractors in Texas. They own 1,685 rotary rigs. These same rotary contractors also own 130 cable-tool rigs. On the date of the survey, 1,357 of these Texas-owned rotaries were at work. Last year, Texas-based contractors drilled about 10,000 of the 53,390 wells completed in the United States.

Not all of these Texas contractors rely wholly on their rigs to support them. Some 371, or about 72 per cent of the total, also own oil production of their own.

Here's the way that Lone Star State contractors breakdown in size:

Those owning:	only 1 rig	142
	2 rigs	125
	3 rigs	85
	4 rigs	50
	5 rigs	37
	6 to 10 rigs	59
	11 to 15 rigs	8
	16 to 20 rigs	4
	21 to 30 rigs	2
	more than 30 rigs	None

TEXAS TODAY

Recently Ellenburger production was found in a Gray County wildcat. This is the first oil in the Panhandle from the formation which is so productive in West Texas. Moreover, Hemphill County has tested its first oil, and Dallam County has its second gas-producing area. Hansford County is enjoying a big Pennsylvanian development.

Generally, drilling is fast and straight. The bulk of it is in Carson, Gray, Hutchinson, Moore, Potter, Roberts, and Hansford counties. Most holes are drilled by light rotaries, but spudder rigs dig many of the shallow wells. In the past, the practice was for cable tools to complete the wells after a rotary had set the oil string above the pay. However, since hydraulic fracturing has proved so successful, many of the wells are drilled to total depth by the rotaries.

Crooked hole is seldom a problem, but loss of circulation does occur occasionally when mud weight builds up excessively because of drilled solids and dissolved salt. The thick, shallow salt beds can raise the chlorides content to near saturation. Since surface water is scarce, diluting the mud is often expensive.

Besides the salt section, shallow, unconsolidated sand formations cause trouble for the contractor. If circulation is lost, these sands can slough into the hole, sticking the pipe. Then, fishing itself is risky because of the danger of sticking the wash pipe. Moreover, the sand has a tendency to become suspended in the mud. This cuts out pump liners quickly, erodes bits, and causes premature failure of bit bearings.

East Texas

Most development drilling in East Texas offers no problem to the contractors. The formations are not extremely hard, and crooked hole is rare. However, the deep wildcats have trouble in drilling shale and salt sections. These formations can stick the drill pipe and bring costly fishing jobs.

Drillers on some wells have reported that the salt section in the Buckner formation sticks the drill stem at the bit, leading some to believe that the salt has a tendency to flow. High mud weights, up to 17 lb. per gal., generally control this sticking tendency.

On development wells, one of the biggest problems is the anhydrite section which contaminates the mud. Therefore, before the hole reaches the anhydrite, the mud is converted to either a low-pH caustic-quebracho with barium carbonate, a low pH-natural mud with phosphate or soda ash, or a high-pH calcium-treated mud.

Texas Tidelands

There are still a lot of questions to be answered about development of the Continental Shelf off Texas. There's no doubt that the oil is there waiting to be discovered. The questions are of time and money. Exploration costs in the gulf are actually cheaper per record than on land. Drilling and production costs are another matter. The offshore well will cost many times the amount for a similar hole on shore. Development of the Texas coast, although it has turned up some five new producing areas in the past year, is still in low gear. No one can be certain when it will pick up enough to be of importance to the drilling industry.

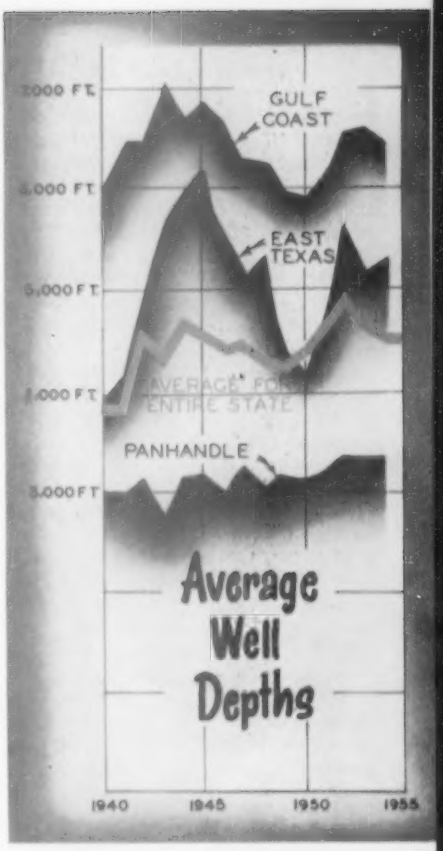
At this date, there are only five wells drilling in the Texas tidelands. Earlier in the year, there were as many as eight. Moreover, the latest sale of submerged lands, held in May, did not bring the big and numerous bids that the first sale in December 1953 turned up. The bids on the outer shelf to be taken by the federal Government in July should be a good indication of what the major operators think about the immediate prospects off Texas.

Mostly platforms . . . Most of the drilling in the Texas tidelands has been from permanent platforms. Submersible barges have drilled some wells; viz., the C. G. Glasscock Drilling Co. barge Mr. "Gus" is drilling a wildcat for Shell off Mustang Island, Nueces County. Kerr-McGee Oil Industries' new Rig 44 has recently plugged a dry hole for The Texas Co. off High Island, Chambers County, and moved back to Louisiana waters.

As far as drilling is concerned, hole conditions in the offshore wells are identical to those in wells on the nearby land. That is, penetration is fast, and hole is straight. Shallow gas zones can cause trouble until cased off, and deeper wells find abnormal-pressure gas sands and salt-water flows.

One of the few departures from standard practice that has come out of the offshore drilling is use of sea-water muds. Where the operator must haul the fresh water supply for his mud from a long distance, costs go up fast. Then, using sea water and proper chemical treatment is actually cheaper.

Drilling equipment must, of course, be modified for barge or platform service. First, it must be protected against corrosion if it is exposed. Recently one company had one of its largest ram-type blowout preventers galvanized to cut down on the care needed to keep



AVERAGE WELL DEPTHS for various sections of Texas. Texas rigs are doing some of the hardest and some of the easiest drilling on the continent—some of the deepest and some of the shallowest.

it free of corrosion and in operating condition.

Space limitations on drilling equipment make communication between the driller and his engines, pump, etc., a problem. On template-type platforms, the mud tanks and pumps are below deck on the tender. Therefore, the driller must have phone contact with the man on that equipment. On submersible barges, the flow-line, tanks, pumps, and probably the drilling engines are on a deck below the rig floor, so good communication is again necessary.

On Kerr-McGee's Rig 44, the draw works is also on a deck level below the rig floor. The driller operates a remote console to control the drilling line. On the rig floor itself, there is an independent catworks. This drives the rotary table and has both a makeup and breakout cathead.

There has been some trouble in keeping the submersible barges on location once the well is under way. Even with "spuds" driven into the soft gulf floor, high winds and high seas tended to move the barges. However, the operators are combating this tendency by adding steel wings that give more horizontal bearing area against the bottom ooze.

Not really new . . . Actually offshore drilling and production is older than most realize. In fact, British-American Producing Co. found oil in a well drilled from a platform close to the beach at Sabine Pass in 1941. The well has since been abandoned. Before that, Humble Oil & Refining Co. had drilled five dry holes from platforms off Jefferson County.

Moreover, Pure Oil Co. drilled producing wells from platforms off the Bolivar Peninsula of Galveston County, to extend the already producing Caplen field.

In spite of the fact that the shallow water extends farther out on the upper part of the coast, most of the drilling is now on the lower coast—from Galveston southward. Moreover, all except one of the new producers has been found in the Galveston-southward area.

Texas Oilmanac Data

HISTORY OF TEXAS DRILLING
(Source: The Oil and Gas Journal)

	Wells completed	Oil wells	Gas wells	Dry holes	Per cent dry
1889-1900*	97	71	2	24	24.7
1901-1910*	692	462	9	221	32.0
1911-1920*	2,451	1,682	66	703	28.7
1921-1930*	6,352	3,745	306	2,301	36.2
1931	6,381	4,411	244	1,726	27.0
1932	9,133	7,242	167	1,724	18.9
1933	6,559	4,745	140	1,674	25.5
1934	9,310	6,860	291	2,159	23.2
1935	11,235	8,421	276	2,538	22.6
1936	12,024	9,120	388	2,516	20.9
1937	14,275	11,030	425	2,820	19.8
1938	11,810	8,892	341	2,577	21.8
1939	9,325	6,683	314	2,328	25.0
1940	9,094	6,632	289	2,173	23.9
1941	9,827	7,258	294	2,275	31.3
1942	4,688	3,041	186	1,461	31.2
1943	4,421	2,373	140	1,908	43.1
1944	5,729	3,526	268	1,935	33.8
1945	7,195	4,036	714	2,445	34.1
1946	7,804	4,720	499	2,585	33.1
1947	9,301	5,814	537	2,950	31.7
1948	12,251	7,619	542	4,090	33.4
1949	13,665	8,613	746	4,300	31.4
1950	16,585	10,665	647	5,273	31.8
1951	16,655	10,086	726	5,843	35.0
1952	16,845	9,682	778	6,385	37.8
1953	17,003	9,380	978	6,648	39.0
1954	18,865	11,068	912	6,885	37.5

*Annual averages.

WILDCAT WELLS DRILLED IN TEXAS
(Source: The Oil and Gas Journal)

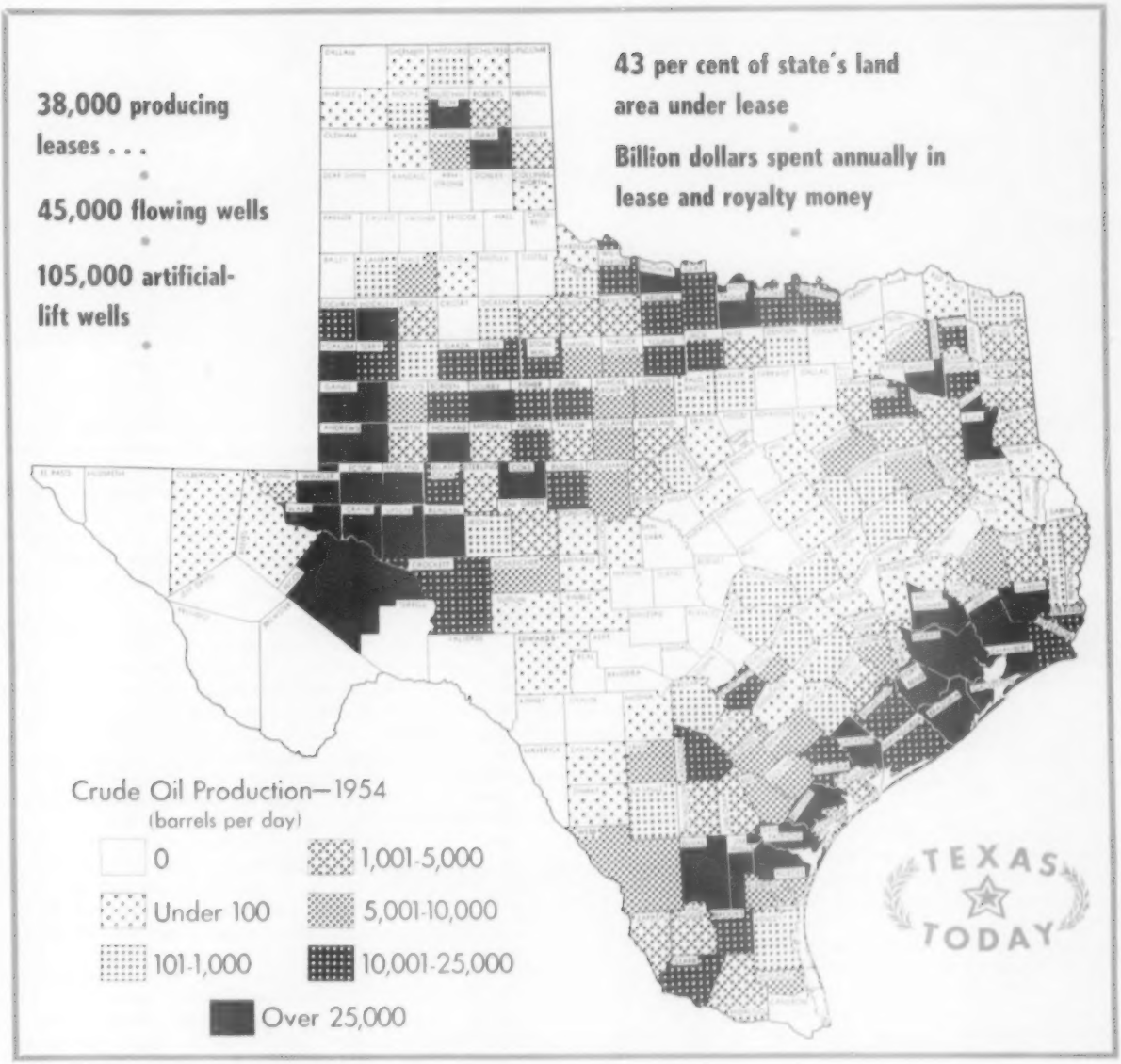
	Total	Oil	Gas	Dry	Per cent dry
1944	1,275	170	33	1,072	84.2
1945	1,552	228	44	1,280	82.4
1946	1,591	247	34	1,310	82.3
1947	1,895	355	80	1,460	77.0
1948	2,568	377	104	2,087	81.4
1949	2,791	440	112	2,239	80.1
1950	3,443	575	113	2,755	79.8
1951	4,408	802	133	3,473	78.8
1952	4,851	823	126	3,902	80.4
1953	5,245	904	169	4,172	79.6
1954	5,190	823	163	4,204	81.0

TEXAS PRODUCING DEPTH RECORDS

Area—well, field, and county—	Result	Year	Producing formation	Depth
West Texas—Phillips 1-E Puckett, Glenna pool, Pecos County	Gas	1953	Ellenburger	15,000
Texas Gulf Coast—Stanolind 1 Sanborn, S. Williams Survey 106, Matagorda County	Cond.	1954	Frio	13,068
East Texas—Tide Water 1 Ramey Unit, New Hope field, Franklin County	Cond.	1953	Smackover	12,341
Southwest Texas—Western Natural Gas 14 St. Charles Ranch, Blackjack field, Aransas County	Gas	1951	Frio	11,490
Panhandle—Phillips 1 Troy A, M-2, Section 86, H&GN Survey, Gray County	Oil	1955	Ellenburger	11,290
North Texas—Frank Weiner 1 Haslip, Mineral Creek, Grayson County	Cond.	1952	Mulder	10,168

TEXAS DRILLING DEPTH RECORDS

Area—well, field, and county—	Result	Year	Producing formation	Depth
West Texas—Hunt 47 Elsinore, 21-B-GC&SF, Pecos County	Dry	1955	Ellenburger	18,673
Southwest Texas—Superior 27 Minnie S. Welder, Portilla field, San Patricio County	Oil	1951		17,966
Gulf Coast—Magnolia 1 Le Tulle, Matagorda County	Dry	1954	Tertiary	17,001
East Texas—Humble 1 McWatters, Freestone County	Oil	1949	Smackover	16,347
North Texas—Humble 1 Williams, Grayson County	Dry	1953		14,363
Panhandle—Gulf 1-E Porter A, Lipscomb County	Dry	1949	Ellenburger	14,278



CRUDE-OIL PRODUCTION in Texas in 1954. (Map courtesy Texas Mid-Continent Oil and Gas Association.)

Texas Producers in Lead for 27 Years

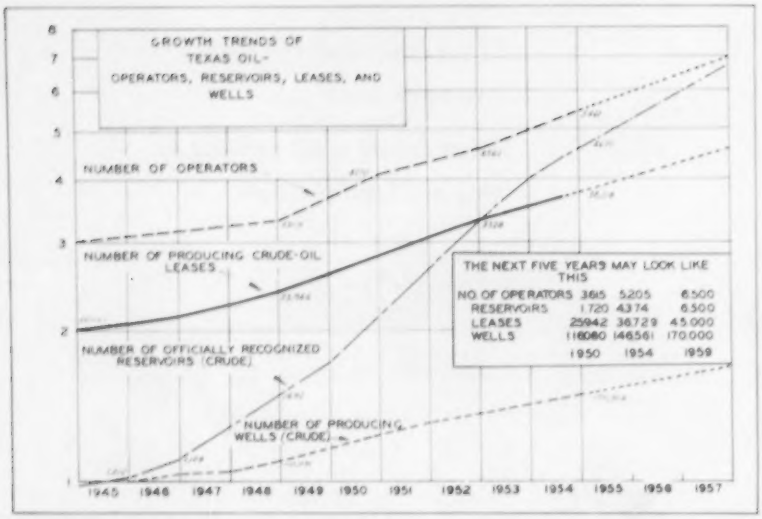
. . . and still produce 40 per cent of the nation's oil

by Ed McGhee
District Editor

IN 1928, Texas took the lead in oil production for the United States. No other state has come close since. That year, Texas edged ahead by producing 28.5 per cent of the country's total crude oil. And since 1944, the Texas figure has never been less than 40 per cent of the nation's total.

Here are a few of the things that make Texas the country's No. 1 producer. Operating companies have 43 per cent of the land area of the state under lease for oil and gas. In fact, there are more than 38,000 individual leases producing today. To the landowners, the companies pay more than half a billion dollars annually in lease and royalty money. On these leases 45,000 wells are flowing naturally; another 105,000 are artificially lifted.

Producing formations and conditions vary widely from one end of the state to the other. Here is a rundown on the major areas.


GROWTH TRENDS OF TEXAS OIL- OPERATORS, RESERVOIRS, LEASES, AND WELLS
NUMBER OF OPERATORS
NUMBER OF PRODUCING CRUDE-OIL LEASES
NUMBER OF OFFICIALLY RECOGNIZED RESERVOIRS (CRUDE)
NUMBER OF PRODUCING WELLS (CRUDE)
THE NEXT FIVE YEARS MAY LOOK LIKE THIS
NO. OF OPERATORS 3615 5205 6500
RESERVOIRS 1720 4374 6500
LEASES 25942 36729 45000
WELLS 116080 146561 170000
1950 1954 1959
1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957

TEXAS OIL PRODUCTION has grown prodigiously since 1947, and is scheduled for healthy increases through 1957.

North Texas

North Texas is the independent operators' country. Four things make it that way. First, the production is shallow. Except in Cooke and Grayson counties, not many of the wells are deeper than 5,000 ft.; and the average new well in the entire area is only 3,200 ft. Second, the wells produce on the average less than 10 bbl. of oil per day. Then, the leases are small. Furthermore, not many of the fields are large. These things make it easier for the independent with a low overhead to compete with the major companies.

North Texas — Railroad Commission's Districts 7-B and 9—claims more producing wells than any other Texas area. Some of the main producing zones are the Cisco, Canyon, and Strawn sands of Pennsylvanian age; several Mississippian sands; and the Ellenburger of Lower Ordovician age.

Hydraulic fracturing has brought rejuvenation to some of the older fields in North Texas. Generally, the treatments are small and not of high injection rates.

Only about 10 per cent of North Texas wells flow naturally. Almost all the remainder are pumpers, as there is very seldom enough gas to use for gas lift. Stripper operation is the common thing, and old central-power units which operate several individual pump jacks are still a common sight in this area.

By contrast to the rest of North Texas, Cooke and Grayson counties' production is mostly new. Big Mineral and Walnut Bend fields are still under development, and pay zones are usually below 5,000 ft. Most wells cut more than one productive zone, and one well tested 13 separate oil sands. Dual completions, as a result, are commonplace.

Texas Gulf Coast

Like North Texas, the Gulf Coast contains many independent operators—but the production is much different. Railroad Commission Districts 2 and 3, which comprise the area, still have much shallow production. And, deep or shallow, recoveries are good. Moreover, lifting costs are generally low. These things have attracted independents. However, major companies are doing most of the deep, expensive drilling to lower producing zones.

RECEIVER for vapor-recovery setup on West Texas tank battery.

Gulf Coast producing wells are divided about evenly between flowing and pumping wells. Many of the sands have efficient water drives, so that flowing life is prolonged. As the wells go to depletion, however, large volumes of water must be handled.

Average production for wells in this area — under proration — is about 32 bbl. of oil per day. Obviously, stripper operation does not account for much of the Gulf Coast's production.

Probably more gas lifting is done in this area than in any other in the country. This is because gas is plentiful and because it is often necessary to handle large volumes of fluid in the artificially lifted well.

Hydraulic fracturing, which has meant so much to other Texas areas, gives very little stimulation in most Gulf Coast wells. As a result, treatments are not widespread.

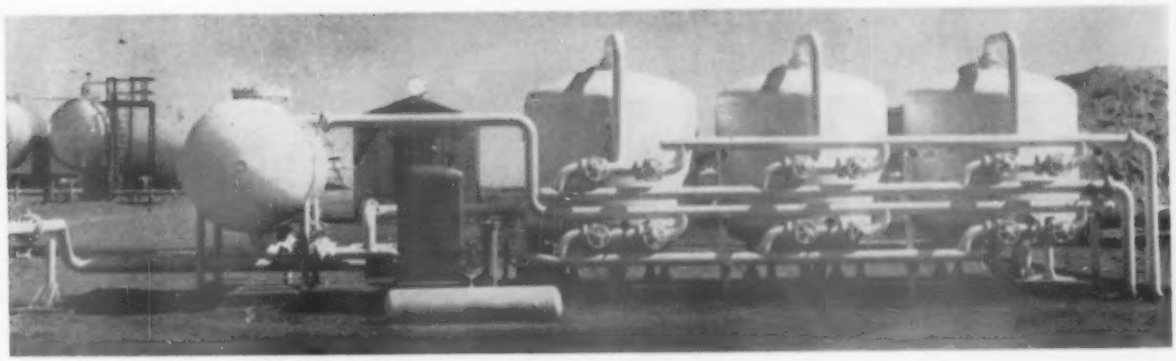
Producing formations in this area are young—being of Eocene age or younger. Some of the important producing sands are the Anahuac, Frio, Vicksburg, Fayette, and Yegua.

Especially for the coast . . . Texas' Gulf Coast is the birthplace of the most revolutionary development in well mechanics in recent years—the permanent-type completion. And Gulf Coast conditions make the technique especially valuable there. First, most wells in the area have several prospective zones to test; the permanent-type completion makes testing a zone cheaper; and, therefore, more zones can be tested.

Second, the equipment used for the permanent-type completion is light and easily transported. Many Gulf Coast locations are difficult to maneuver with heavy, conventional workover equipment. Overwater locations where conventional practice calls for a barge rig are especially costly.

Another saving comes from the fact that the permanent-type completion is not dependent on depth in determining cost. Theoretically, a 12,000-ft. well can be worked over with this technique for the same cost as a 2,000-ft. well. When we consider that the average Gulf Coast well now drilled is 6,500 ft. deep, we see how depth-dependent costs are important.

Another advantage is the fact that testing on the permanently completed well is done after the tubing is already in place and wellhead equipment in-



FILTRATION UNIT for water-flood project in West Texas.

stalled. This means that high-pressure zones can be tested more safely. High-pressure—and even abnormal pressure—zones are all too common on the coast, so safety is important. Humble Oil & Refining Co., developer of the technique, reports working on wells with more than 1,000 psi. on the wellhead although there was a column of salt water in the hole.

Gas lift is the form of artificial lift most easily adapted to the permanent-type completion. Since gas usually is available in the area, this presents no problem. However, in some instances, rod pumping is being used.

There are certain other advantages to the permanent-type completion that save money anywhere. First, the drilling rig can be released immediately after the oil string is cemented and the tubing in place. This saves several days of rig time during testing. Second, squeeze cementing does not require large volumes nor special tools.

Corrosion—a big problem . . . Texas Gulf Coast producers aren't without their problems, and corrosion is one of the worst. It is particularly troublesome in deep, high-pressure wells. Operators use alloy tubing and various types of inhibitors to control this sweet-oil corrosion. When tubing in high-pressure wells fails because of corrosion, the well pressure is thrown on the casing and the casinghead—usually a dangerous situation.

Operators also have corrosion problems with flow lines as well as any equipment exposed to the salt atmosphere. As a result, buried lines are coated and wrapped. And surface equipment is painted or otherwise coated.

Reservoir problems . . . Two problems that give Gulf Coast operators a lot of concern are water encroachment and sand control. Since the water drives are very often strong, withdrawals from the reservoir must be controlled to prevent "coning" or "fingering" of the advancing water. Water-block breakers have been effective in some instances, but regulation of production rate is probably the most effective means of preventing the bypassing of oil.

Sand control is still an unsolved problem. Screens and liners often do the trick, and plastic squeezed into the formation helps in other cases. The gravel-pack technique got its start on the Gulf Coast, and is still used extensively.

Texas Tidelands

Texans don't like to admit it, but the state doesn't **yet** lead in offshore production. That honor still belongs to neighboring Louisiana. But, every Texan is certain that it is only a question of time till Texas will be biggest in that department too.

During the past year, Texans have had their first encouragement in offshore exploration. In July 1954, Standard Oil Co. of Texas 53 State Tract 948 was completed for a flow of 254 bbl. daily of 40° oil from the Frio at 7,760 ft. This was the first offshore field. Within the past 9 months, five additional fields have been established in offshore areas; three are oil fields and two are gas, giving the state as of today a score of three oil fields and three gas fields.

Not really first . . . Actually, these discoveries are not the first offshore producers. There have been cases where producing wells were drilled from platforms in the gulf to extend known producing fields on the land. And there have been wells on the shore that were directionally drilled to some pay zone lying under the gulf.

Reservoirwise, these offshore wells are no different from wells "on the bank." The fields are just like others on the Gulf Coast. Equipmentwise, however, the offshore well is a different problem. It must, of course, be elevated above the seas and have a platform from which to perform routine servicing work. Likely, the platform will have a separator and a heater-treater; and possibly it will also have oil-storage tanks. The expense of building and maintaining these overwater facilities will make almost anything but a major field noncommercial.

Since there may be times when it will be impossible for personnel to reach the offshore well, automatic controls are a necessity.

Texans cite the fact that the Continental Shelf is merely an underwater extension of the coastal plain. Surely, they say, enough wildcatting will make the underwater part of the plain as productive as the dry-land part. And there's wildcatting aplenty off the Texas coast.

West Texas

West Texas is truly a place apart. Only the State of Texas is big enough to hold it. In fact, Railroad Commission Districts 7-C and 8—West Texas—produce more oil than any other oil state. The reserves are greater than those of any other state. This area has almost 40 per cent of the total production and reserves in Texas. It contains 25 of the 65 fields in Texas whose ultimate recovery will exceed 100,000,000 bbl. of oil.

This area is still called "the Permian basin" by industry and nonindustry people alike, because the first big production there was from Permian formations. Today, however, the area's production also comes from formations of Pennsylvanian, Mississippian, Devonian, Silurian, Ordovician, and, most recently, Cambrian ages.

Fracturing makes news . . . Much of the news about production in West Texas during the last few years has been about the Spraberry sand. Rates of production from wells completed in this zone dropped so rapidly after completion that the Spraberry trend came to be known as the "largest noncommercial oil field in the world." Latest development in the Spraberry is the use of big-volume, high-injection-rate fracture treatments. In most wells, these big treatments have brought

TREATING PLANT for water-flood project in West Texas.

TEXAS TODAY

enough added oil production to pay for the treatment. But not all of them have accounted for enough oil to pay for the cost of drilling the well.

Other fields have had a complete rejuvenation as a result of successful fracturing. An outstanding example is the old Harper pool of Ector County. Average production in the field was down to an average of about 3 bbl. of oil per day per well. The fractured wells have come in for as much as 140 bbl. per day. Settled production from these wells is 70 to 80 bbl. per day. This field produces from the San Andres dolomite; in several other fields, the Yates sand has responded very well to fracturing.

New equipment, too . . . Two developments in production equipment have made news in West Texas lately. First was Shell Oil Co.'s automatic tank batteries in Wasson field. The company has at least 12 lease batteries under "pushbutton operation." These batteries are set up so that the only manual operation required is to set up the allowable schedule each month. Only a few man-hours per month are required by each.

The equipment will test each well in the battery periodically for as long as needed. It will record the volumes of oil, gas, and water produced. Then, the well will be switched back to production headers, and another well will be tested. These batteries are also equipped with devices to recirculate stock-tank oil in case the b.s. and w. content runs too high.

Several West Texas operators are making dual completions using two independent tubing strings. This two-string method does away with several objections to other style dual completions. First, the strings are not held together by clamps—which have been a source of trouble in the past. Second, there is a straight-through work space to each zone; wire-line tools can be run to either without interfering with the other zone. Then, either zone can

Texas Oilmanac Data

The First 100 Producers of Texas Crude Oil

Rank	Company—	Barrels daily	No. wells
1	Humble Oil & Refg. Co.	322,185	10,708
2	Stanolind Oil & Gas Co.	153,697	6,072
3	Gulf Oil Corp.	124,514	6,455
4	Magnolia Pet. Co.	124,072	7,119
5	The Texas Co.	113,294	5,856
6	Sun Oil Co.	80,073	2,892
7	Shell Oil Co.	75,451	3,328
8	Phillips Petroleum Co.	69,250	2,901
9	Atlantic Refg. Co.	65,883	2,681
10	Scurry Area Canyon Reef Operators Co.	48,416	1,026
11	Continental Oil Co.	47,432	2,126
12	Sinclair Oil & Gas Co.	47,080	2,240
13	Tide Water Associated Oil Co.	43,369	1,795
14	Amerada Pet. Corp.	32,404	1,301
15	Ohio Oil Co.	31,285	1,100
16	Standard Oil Co. of Texas	28,378	811
17	Sunray Oil Corp.	27,456	1,086
18	Skelly Oil Co.	27,387	1,244
19	Superior Oil Co.	21,772	533
20	Cities Service Oil Co.	20,341	1,250
21	Texas Pacific Coal & Oil Co.	19,856	996
22	Pure Oil Co.-Van Joint Account	19,646	400
23	General Crude Oil Co.	18,177	387
24	Quintana Pet. Co.	17,852	454
25	Pan Amer. Prod. Co.	16,384	504
26	Plymouth Oil Co.	15,573	533
27	Pure Oil Co.	15,105	498
28	Warren Pet. Corp.	15,085	824
29	Honolulu Oil Corp.	12,791	536
30	Am. Republics Corp.	12,142	328
31	Seaboard Oil Co.	11,611	443
32	Gen. Amer. Oil Co.	11,012	904
33	Fullerton Oil Co.	10,722	606
34	Lion Oil Co.	10,565	288
35	Sohio Petroleum Co.	9,920	323
36	Tennessee Prod. Co.	9,769	787
37	Anderson-Prichard Oil Corp.	9,533	310
38	Texas Gulf Prod. Co.	8,832	244
39	Cities Prod. Corp.	8,805	262
40	Southern Minerals Corp.	8,591	269
41	Richardson & Bass	8,463	226
42	Arkansas Fuel Oil Co.	8,220	697
43	John W. Mecom	8,034	123
44	Union Producing Co.	7,728	283
45	Seaboard Oil Co. et al.	7,086	129
46	Kewanee Oil Co.	6,984	674
47	Houston Oil Co. & Amer. Republics	6,977	136
48	Union Oil Co. of California	6,927	200
49	Mid-Cont. Pet. Co.	6,797	337
50	R. E. Smith	6,728	253
51	Stanolind & Landreth	6,667	249
52	Chapman & McFarlin	6,124	244
53	Houston Oil Co. of Texas	6,062	265
54	Forest Oil Corp.	5,761	292
55	Copano Oil Co.	5,666	123
56	The Chicago Corp.	5,603	191
57	Hewitt, C. Est. of Dougherty, J. R.	5,380	148
58	Republic Nat. Gas Co.	5,329	172
59	Shamrock Oil & Gas Co.	5,137	313
60	Burns, L. T. Estate	4,929	345
61	Hunt Oil Co.	4,658	236
62	Oil & Gas Property Management, Inc.	4,601	132
63	Cox & Hamon	4,566	405
64	Renwar Oil Corp.	4,268	123
65	Argo Oil Corp.	4,250	144
66	La Gloria Oil & Gas Co.	4,238	142
67	Bridwell Oil Co.	4,131	545
68	Deep Rock Oil Corp.	4,023	174
69	Huber, J. M., Corp.	3,998	321
70	Brown Brothers et al., operators	3,946	198
71	Katz, Sid	3,890	87
72	Southern Production Co., Inc.	3,862	239
73	Woodson Oil Co.	3,615	153
74	Placid Oil Co.	3,457	149
75	Lone Star Prod. Co.	3,228	231
76	Monterey Oil Co. of Texas	3,197	20
77	Woodley Pet. Co.	3,122	274
78	Feldman, DD, Oil Gas	3,075	295
79	Kimbell, Kay	3,064	127
80	Johnson, F. Kirk	3,034	134
81	Cabot Carbon Co.	3,006	104
82	Rowan Oil Co.	2,978	70
83	British-American Oil Prod. Co.	2,967	174
84	Moncrief, W. A.	2,912	88
85	Hamon, Jake L., Jr.	2,880	248
86	Richardson, Sid W., Inc.	2,867	248
87	Lacy, R., Inc.	2,865	116
88	Great Western Drilling Co.	2,853	145
89	W-FM-W Oil Co.	2,842	157
90	Drilling Exploration Co., Inc.	2,836	262
91	Union Sulphur & Oil Corp.	2,810	127
92	Coronet Oil Co.	2,776	41
93	McCarthy Oil & Gas Corp.	2,745	64
94	Panhandle Oil Corp.	2,710	173
95	Kerr McGee Oil Industries	2,688	197
96	Michaux et al.	2,664	92
97	Ada Oil Co.	2,638	89
98	Midstates Oil Corp.	2,636	183
99	Indian Royalty Co.	2,475	78
100	Goldston Oil Corp.	2,456	118

Texas Oilmanac Data

Here Are the Texas Counties That

County—	Year of disc. of oil or gas	Annual crude prod. Total bbl.	Annual crude prod. Bbl. per day	Total crude prod. to Jan. 1, 1955 (bbl.)
Anderson	1929	2,971,688	8,142	79,299,987
Andrews	1930	44,055,568	120,700	348,357,039
Angelina	1936	3,216	9	103,774
Aransas	1936	3,500,728	9,591	26,839,780
Archer	1911	8,486,572	23,251	251,192,175
Atascosa	1917	3,900,495	10,686	31,696,063
Austin	1915	2,264,386	6,204	53,412,934
Bastrop	1913	136,929	375	6,327,925
Baylor	1924	1,096,051	3,003	13,616,724
Bee	1930	2,349,227	6,436	50,778,537
Bexar	1889	133,989	367	14,892,710
Borden	1949	5,754,981	15,767	31,693,946
Bowie	1944	25,788	71	401,749
Brazoria	1902	25,060,108	68,658	543,537,879
Brazos	1942	(gas only)		(gas only)
Brooks	1936	4,607,156	12,622	49,346,134
Brown	1917	565,162	1,548	35,889,817
Burleson	1938	1,627	4	30,638
Caldwell	1922	2,677,052	7,334	163,868,324
Calhoun	1935	1,541,491	4,223	33,386,338
Callahan	1923	2,101,849	5,758	21,771,811
Cameron	1944			49,820
Camp	1940	242,046	663	2,744,045
Carson	1921	3,178,678	8,709	86,440,762
Cass	1935	480,941	1,318	52,136,175
Chambers	1916	15,521,548	42,525	349,841,476
Cherokee	1926	779,864	2,137	6,103,209
Clay	1902	5,551,162	15,209	66,597,132
Cochran	1936	7,881,125	21,592	86,497,380
Coke	1942	13,434,645	36,807	39,366,048
Coleman	1902	3,333,870	9,134	32,749,405
Collingsworth	1936	1,227	3	5,263
Colorado	1932	405,318	1,110	3,142,622
Comanche	1918	198,404	544	4,040,829
Concho	1940	23,030	63	76,725
Cooke	1926	7,622,733	20,884	107,078,877
Crane	1926	19,469,780	53,342	331,037,741
Crockett	1925	8,279,741	22,684	81,571,571
Culberson	1953	859	2	2,801
Dawson	1937	2,636,256	7,223	17,305,994
Denton	1937	201,768	553	1,776,708
DeWitt	1930	2,948,003	8,077	13,168,549
Dickens	1953	31,450	86	71,179
Dimmitt	1943	56,947	156	121,499
Duval	1905	11,773,997	32,258	318,400,345
Eastland	1917	973,418	2,667	112,896,915
Ector	1926	48,827,875	133,775	682,225,518
Edwards	1946	1,758	5	24,755
Ellis	1953	3,423	9	4,133
Erath	1917	29,152	80	1,123,805
Falls	1937	12,239	34	183,388
Fannin	1949			10,194
Fayette	1943	338,918	929	1,481,195
Fisher	1928	5,038,598	13,804	39,523,044
Floyd	1952	5,018	14	22,539
Foard	1929	77,953	214	2,595,576
Fort Bend	1919	11,747,797	32,186	281,872,005
Franklin	1936	4,523,386	12,393	76,522,855
Freestone	1916	245,319	672	28,314,015
Frio	1934	3,440,709	9,427	14,335,666
Gaines	1936	19,059,051	52,217	180,844,640
Galveston	1922	9,557,052	26,184	139,398,837
Garza	1926	4,237,308	11,609	27,975,835
Glasscock	1925	5,604,626	15,355	58,329,664
Goliad	1930	2,403,253	6,584	24,216,458
Gonzales	1902	35,236	97	129,996
Gray	1925	12,405,567	33,988	364,388,749
Grayson	1930	7,519,490	20,601	21,951,847
Gregg	1931	49,147,612	134,651	1,677,070,668
Grimes	1952	21,357	59	100,358
Guadalupe	1922	3,834,165	10,505	93,827,960
Hale	1946	2,302,198	6,307	16,416,128
Hamilton	1938	619	2	5,039
Hansford	1937	72,833	200	87,524
Hardeman	1944	2,005	5	12,725
Hardin	1893	9,251,510	25,347	220,145,956
Harris	1905	23,783,148	65,159	638,102,905
Harrison	1928	1,266,619	3,470	6,418,661
Hartley	1937	3,110	9	18,012
Haskell	1929	3,241,907	8,882	12,527,591
Henderson	1934	927,185	2,540	18,144,327
Hidalgo	1934	682,205	1,869	13,710,529
Hill	1949	53		831
Hockley	1937	14,686,019	40,236	208,011,296
Hopkins	1936	2,287,568	6,267	32,634,899
Houston	1934	709,020	1,943	7,851,619
Howard	1925	12,538,313	34,352	184,649,369
Hunt	1942	32,349	89	1,554,223
Hutchinson	1923	12,206,359	33,442	301,606,449
Irion	1928	58,015	159	602,421
Jack	1923	6,687,154	18,321	64,710,686
Jackson	1934	11,475,679	31,440	181,197,297
Jasper	1928	293,431	804	558,676
Jefferson	1901	8,457,881	23,172	263,222,997
Jim Hogg	1922	1,335,838	3,660	34,248,685
Jim Wells	1933	15,263,584	41,818	204,513,089
Jones	1926	7,757,080	21,252	91,611,936
Karnes	1930	2,065,393	5,659	26,056,577
Kaufman	1948	1,307,783	3,583	5,176,808
Kenedy	1947	156,089	428	992,992
Kent	1946	6,540,038	17,918	24,722,720
Kimble	1939	3,092	8	21,739

be pumped without disturbing the other. In some wells both zones are being sucker-rod pumped by individual pumping units.

Most are pumpers . . . Only about one-third of West Texas wells are flowing. Most of the rest are beam pumped. Average production per well — under proration—is about 25 bbl. per day; and average depth of the new completions is about 5,600 ft. Lifting costs are not generally high because leases are mostly large.

Corrosion and scale deposition are problems in some areas. In Midland Farms field, the operator has had to use redwood treaters because steel equipment failed so soon.

Other Areas

Other than the areas already mentioned, East Texas — Districts 5 and 6—produces the most oil, about 15 per cent of the state's total. More than half of that oil comes from East Texas field itself. This is included in the section on secondary recovery elsewhere in the issue.

The area generally called Southwest Texas is made up of Districts 1 and 4. District 4 produces more than 9 per cent of the state total and is similar in most respects to the Gulf Coast area. District 1 produces about 1.5 per cent of the Texas crude. The Panhandle, District 10, produces about 3 per cent.

"Several West Texas operators are making dual completions using two independent tubing strings. In some wells both zones are being sucker-rod pumped by individual pumping units."

Produce Oil and Gas; and Amount of Oil Produced

County—	Year of disc. of oil or gas	Annual crude prod. Total bbl.	Annual crude prod. Bbl. per day	Total crude prod. to Jan. 1, 1955 (bbl.)
King	1943	1,162,859	3,186	9,530,467
Kleberg	1926	2,758,991	7,559	27,856,845
Knox	1946	1,071,414	2,935	3,405,568
Lamb	1945	74,013	203	1,522,441
LaSalle	1940	68,014	186	2,459,707
Lavaca	1941	235,329	645	1,539,485
Lee	1939	2,022	6	17,352
Leon	1936	188,772	517	1,990,150
Liberty	1905	13,027,045	35,691	230,316,759
Limestone	1920	307,848	843	107,116,764
Live Oak	1931	1,072,246	2,938	6,270,456
Loving	1925	1,593,054	4,365	20,049,778
Lubbock	1941	405,525	1,111	1,180,308
Lynn	1950	112,813	309	318,655
Madison	1946	29,974	82	113,398
Marion	1910	951,534	2,607	17,890,218
Martin	1945	589,386	1,615	2,250,294
Matagorda	1904	5,111,098	14,003	84,892,193
Maverick	1929	(gas only)		5,469
McCulloch	1938	2,075	6	4,300
McLennan	1902	6,208	17	155,942
McMullen	1919	729,725	1,999	12,832,457
Medina	1901	19,241	53	387,695
Menard	1941	337	1	749
Midland	1945	13,064,438	35,793	49,054,392
Milam	1921	49,152	135	4,432,214
Mitchell	1920	1,175,016	3,219	19,193,217
Montague	1924	8,665,181	23,740	119,578,290
Montgomery	1931	11,017,382	30,185	341,792,327
Moore	1926	100,607	276	6,982,103
Nacogdoches	1889	20,125	55	374,976
Navarro	1895	2,240,535	6,138	157,639,197
Newton	1937	865,344	2,371	4,545,465
Nolan	1939	4,248,287	11,639	7,481,985
Nueces	1930	15,504,523	42,478	283,594,615
Ochiltree	1951	20,349	56	87,314
Orange	1913	3,827,958	10,488	66,904,826
Palo Pinto	1902	268,346	735	6,887,654
Panola	1917	458,596	1,256	3,346,376
Parker	1942	60,558	166	428,947
Pecos	1926	16,893,917	46,285	492,540,861
Polk	1930	1,965,893	5,386	43,763,545
Potter	1925	2,430	7	46,503
Reagan	1923	11,107,064	30,430	148,313,732
Red River	1951	6,769	19	13,413
Reeves	1939	326,329	894	5,096,826
Refugio	1928	18,239,130	49,970	389,174,233
Roberts	1949	1,376,253	3,771	2,004,669
Robertson	1944	22,592	62	636,751
Runnels	1927	6,169,571	16,903	32,868,861
Rusk	1930	29,169,161	79,916	1,152,708,860
San Augustine	1947			11,709
San Jacinto	1940	603,722	1,654	11,905,635
San Patricio	1930	16,697,671	45,747	203,985,305
Schleicher	1937	3,192,467	8,746	11,644,554
Scurry	1923	36,133,551	98,996	228,794,568
Shackelford	1910	2,505,546	6,865	68,452,799
Shelby	1917	9,614	26	141,385
Sherman	1938	17,919	49	170,546
Smith	1931	1,267,250	3,472	110,923,544
Starr	1929	7,515,182	20,590	103,565,196
Stephens	1916	2,403,866	6,586	156,626,595
Sterling	1947	605,041	1,658	1,665,593
Stonewall	1938	7,950,780	21,783	22,410,647
Sutton	1948	20,691	57	46,654
Taylor	1929	1,623,392	4,448	15,239,194
Terrell	1952	(gas only)		(gas only)
Terry	1940	5,778,970	15,833	22,078,104
Throckmorton	1924	3,214,176	8,806	29,645,547
Titus	1936	4,102,927	11,241	96,432,153
Tom Green	1940	1,338,440	3,667	7,534,607
Travis	1934	40,624	111	254,439
Trinity	1946	(gas only)		(gas only)
Tyler	1937	722,080	1,978	9,644,475
Upshur	1931	3,281,791	8,991	204,151,409
Upton	1925	17,353,302	47,543	186,980,589
Val Verde	1935			(gas only)
Van Zandt	1929	8,834,230	24,203	246,554,508
Victoria	1931	7,101,736	19,457	110,664,465
Walker	1934	9,191	25	57,960
Waller	1934	381,057	1,044	7,407,827
Ward	1928	9,682,994	26,529	160,305,590
Washington	1915	323,795	887	8,386,760
Webb	1921	2,126,315	5,826	56,226,310
Wharton	1925	7,147,358	19,582	127,422,114
Wheeler	1921	1,238,710	3,394	37,410,229
Wichita	1910	10,413,060	28,529	506,958,155
Wilbarger	1915	4,087,674	11,199	117,042,838
Willacy	1936	2,630,588	7,207	34,458,589
Williamson	1915	47,626	130	8,481,752
Wilson	1941	402,993	1,104	1,219,957
Winkler	1926	14,916,435	40,867	465,140,732
Wise	1942	405,002	1,110	4,354,121
Wood	1941	22,651,431	62,059	251,503,256
Yoakum	1936	17,442,811	47,789	265,142,621
Young	1917	6,156,484	16,867	131,141,091
Zapata	1919	870,489	2,385	23,344,930
Zavala	1937	10,191	28	66,408
Grand total		959,416,013	2,628,537	17,672,870,822

Source: Compiled by Texas Mid-Continent Oil and Gas Association.

Texas Oilmanac Data — Texas Fields That Have Produced 5,000,000 Bbl. or More

Field and county—	1954 B/D	Cumulative Jan. 1, 1955
R.R.C. Dist. 1:		
Big Foot, Frio	6,927	5,501,761
Chapman-Abbott, Williamson	74	5,007,584
Charlotte, Atascosa	3,425	13,851,692
Darst Creek, Guadalupe	9,430	87,712,279
Luling-Branyon, Caldwell	6,699	100,956,546
Lytton Springs, Caldwell	165	9,166,127
Salt Flat, Caldwell	890	49,623,933
Somerset, Bexar	126	12,081,032
R.R.C. Dist. 2:		
Bloomington, Victoria	3,483	12,080,985
Bonnie View, Refugio	1,806	8,555,077
Caesar, South, Bee	688	5,314,134
Coleto Creek, Victoria	746	5,430,978
Cordele, Jackson	551	5,480,136
Dirks, Bee	128	8,047,196
Falls City, Karnes	2,473	11,158,523
Ganado Deep, Jackson	786	6,165,984
Ganado, W., Jackson	1,297	7,824,673
Greta, Refugio	6,110	63,532,999
Helen Gohlke (Wilcox), DeWitt	3,944	6,115,343
Heyser, Calhoun	5,447	40,459,754
La Rosa, Refugio	1,499	15,362,093
La Ward, N., Jackson	1,523	10,172,353
Lolita, Jackson	3,360	25,959,025
Maurbro, Jackson	995	12,074,567
Mayo, Jackson	598	5,466,526
McFaddin, Victoria	2,715	21,242,569
Pettus, Bee	495	14,038,582
Placedo, Victoria	2,969	32,642,948
Placedo, E., Victoria	958	5,295,231
Refugio Fox, Refugio	1,354	42,193,434
Refugio Heard Area, Refugio	994	6,272,804

5,000,000 Bbl. Fields (continued)

Field and county—	1954 B/D	Cumulative Jan. 1, 1955
Refugio, New, Refugio	853	17,193,387
Roche, Refugio	1,680	5,905,297
Slick (Wilcox), Goliad	1,610	12,388,463
Tom O'Connor, Refugio	26,430	205,398,747
West Ranch, Jackson		61,909,785
West Ranch (41-A Zone), Jackson	4,290	8,323,041
West Ranch (98-A Zone), Jackson	3,703	7,310,415
R.R.C. Dist. 3:		
Amelia, Jefferson	3,187	22,901,786
Anahuac, Chambers	14,280	127,173,811
Barber's Hill, Chambers	4,955	100,841,429
Batson, Old, Hardin	279	40,669,374
Bay City, Matagorda	2,292	20,198,960
Beaumont, West, Jefferson	1,439	10,721,803
Big Creek, Fort Bend	409	12,179,808
Blue Ridge, Fort Bend	1,231	16,032,705
Boling, Wharton	2,063	17,039,141
Caplen, Galveston	1,018	5,191,578
Cedar Point, Chambers	2,169	10,101,474
Chocolate Bayou (Upper Frio), Brazoria	3,180	12,602,664
Clay Creek, Washington	507	7,145,994
Clear Lake, Harris	1,594	14,043,647
Cleveland, N., Liberty	422	17,242,271
Conroe, Montgomery	27,553	341,790,930
Damon Mound, Brazoria	1,276	11,432,751
Dickinson, Galveston	684	12,137,618
Dyersdale, Harris	2,668	12,190,518
Esperson Dome, Liberty	1,233	10,523,096
Esperson Dome, South, Liberty	1,596	11,748,719
Eureka Heights, Harris	233	6,295,014
Fairbanks, Harris	3,676	34,766,449
Fannett, Jefferson	3,644	27,044,391
Fig Ridge, Chambers	789	16,372,434
Gillock, Galveston	1,626	20,560,101
Gillock, S., Galveston	3,407	6,962,708
Goose Creek, Harris	6,894	90,804,364
Hamman, Matagorda	304	6,217,243
Hankamer, Liberty	2,157	10,638,520
Hardin, Liberty	309	15,549,997
Hastings, Brazoria	31,684	253,050,769
High Island, Galveston	7,717	39,372,839
Houston, S., Harris	3,600	25,103,342
Hull, Liberty	9,092	120,957,638
Humble, Harris	1,361	131,280,994
Joe's Lake, Tyler	189	6,192,247
League City, Galveston	650	8,514,295
Liberty, S., Liberty	6,437	28,150,383
Livingston, Polk	1,165	12,827,777
Livingston (Wilcox), Polk	1,320	6,993,078
Lochridge, Brazoria	683	9,498,177
Louise, Wharton	346	6,450,104
Lovell's Lake, Jefferson	1,866	20,105,191
Magnet Withers, Wharton	3,922	33,449,355
Manvel, Brazoria	4,677	52,421,947
Markham, Matagorda	1,309	12,999,647
Markham, N. (Cornelius), Matagorda		7,620,965
Mercy, San Jacinto	927	8,722,939
Moores (Orchard), Fort Bend	1,668	6,659,182
Nome, Jefferson	180	6,341,503
Old Ocean, Brazoria		45,102,445
Old Ocean (Armstrong), Brazoria-Matagorda	8,708	26,148,586
Orange, Orange	4,033	37,896,658
Orange, W., Orange		5,631,824
Oyster Bayou, Chambers	8,502	33,191,324
Pickett Ridge, Wharton	1,156	10,748,198
Pierce Junction, Harris	2,833	57,947,632
Port Neches, Orange	1,896	11,835,765
Raccoon Bend, Austin	2,573	24,883,306
Raccoon Bend (Cockfield), Austin	3,084	30,432,694
Red Fish Reef, Chambers	1,268	7,373,540
Saratoga, Hardin	1,552	39,416,184
Seabreeze, Chambers	608	5,314,678
Segno, Polk	752	6,806,607
Segno, Deep, Polk	713	11,394,151
Silsbee, Hardin	2,434	15,104,562
Sour Lake, Hardin	3,973	94,777,464
Spindle Top, Jefferson	1,673	133,235,914
Stowell, Jefferson	4,503	40,540,676
Sugarland, Fort Bend	2,549	50,917,192
Sugar Valley, Matagorda	2,818	13,887,589
Thompson, Fort Bend	19,407	153,255,649
Thompson, N., Fort Bend	2,261	15,370,852
Thompson, S., Fort Bend	2,748	24,471,067
Tomball, Harris	4,808	53,923,145
Turtle Bay, Chambers	997	7,534,085
Village Mills, East, Hardin	7,714	14,694,509
Webster, Harris	28,449	201,484,546
West Columbia, Brazoria	2,330	92,106,459
West Columbia, New, Brazoria	3,973	26,070,411
Withers, N., Wharton	4,280	28,479,594
Withers, Wharton		9,061,209
R.R.C. Dist. 4:		
Agua Dulce, Nueces	3,636	33,678,753
Alice, Jim Wells	25	5,328,070
Alta Mesa (Garcia sand), Brooks	528	5,192,629
Aransas Pass, Aransas-San Patricio	345	19,080,780
Aviators, Webb	273	7,661,576
Benavides, Duval	1,027	21,130,082
Ben Bolt, Webb	465	7,378,393
Brayton, Nueces	1,149	5,750,209
Bruni, Webb	10	6,936,946
Clara Driscoll, South, Nueces	715	7,973,085
Colorado, Jim Hogg	1,633	13,965,389
Conoco-Driscoll, Duval	1,561	15,571,271
Corpus Christi, Nueces		6,790,627
Escobas, Zapata	344	10,251,575
Flour Bluff, Nueces	1,843	12,847,573
Garcia, Starr	2,932	12,728,636
Government Wells, N., Duval	2,992	61,244,348
Government Wells, S., Duval	1,000	10,032,479
Hoffman, Duval	4,115	27,041,236
Kelsey, Jim Hogg	1,927	10,502,029
Loma Novia, Duval	2,213	38,885,099
London Gin, Nueces	2,177	5,285,446
Lopez, Webb	940	18,623,837
Luby, Nueces	1,365	17,750,786
Lundell, Duval	705	5,672,504
Midway, San Patricio	667	15,270,367
Minnie Bock, Nueces	944	8,357,959
Mirando City, Webb	218	10,856,278
Odem, San Patricio	879	7,651,277
O'Hern, Webb	743	14,995,686
Piedre Lumbre, Duval	2,751	11,256,635
Plymouth, San Patricio	6,209	61,720,677
Randado, Jim Hogg	113	5,470,734
Richard King, Nueces	1,329	12,717,737
Rincon, Starr	2,933	27,018,901
Rincon (Vicksburg), Starr	3,435	6,380,250
San Fordyce, Hidalgo	47	7,862,875
Saxet, Nueces	1,522	53,335,375
Saxet, Frio, Nueces	287	14,304,419
Seeligson, Jim Wells		14,932,719
Seeligson (Zone 14-B), Jim Wells-Kleberg	2,006	10,330,205
Seeligson (Zone 16), Jim Wells-Kleberg		5,126,302
Seeligson (Zone 19-B) Jim Wells-Kleberg	3,083	14,050,429
Seeligson (Zone 19-C) Jim Wells-Kleberg	7,139	36,168,353
Seeligson (Zone 20) Jim Wells-Kleberg	2,126	10,656,073
Seven Sisters, Duval	3,216	40,864,243
Stratton, Jim Wells-Kleberg-Nueces	6,535	42,284,080
Sun, Starr	1,865	12,270,608
Sun, North, Starr	1,801	6,234,657
Taft, San Patricio	42,280	16,225,986
Tijerina-Canales-Blucher, Jim Wells-Kleberg	7,168	20,398,161
Tijerina-Canales, Jim Wells		7,365,520
Tom Graham, Jim Wells	575	5,223,925
Turkey Creek, Nueces	545	8,773,345
Wade City, Jim Wells	495	9,009,560
White Point, E., San Patricio	8,083	55,260,247
Willamar, Willacy	2,586	27,092,577
Willamar, W., Willacy	4,093	6,001,928
R.R.C. Dist. 5:		
Corsicana, Shallow, Navarro	3,098	16,190,904
Currie, Navarro	42	7,179,601
Mexia, Limestone	777	103,165,714
Opelika, Henderson	1,571	6,357,352
Pickton, Hopkins	4,036	8,489,602
Powell, Navarro	864	125,530,098
Richland, Navarro	22	6,767,599
Sulphur Bluff, Hopkins	1,558	21,390,709
Van, Van Zandt	23,965	250,312,461
Wortham, Freestone	130	23,845,279
R.R.C. Dist. 6:		
Boggy Creek, Cherokee	104	5,655,291
Cayuga, Anderson-Henderson	2,965	47,203,976
Coke, Wood	853	6,960,270
E. Texas, Gregg-Cherokee-Upshur	222,954	3,079,994,288
Hawkins, Wood	45,445	183,220,254
Long Lake, Anderson-Freestone	2,210	22,798,504
Manziel, Wood	1,371	6,296,880
Merigale-Paul, Wood	1,087	6,420,354
New Hope, Franklin	1,854	9,287,606
New Hope (Bacon lime), Franklin	2,924	6,307,576
Pewitt Ranch, Titus	3,268	6,570,030
Quitman, Wood	4,517	24,883,908
Rodessa, Marion	1,124	10,906,316
Sand Flat, Smith	1,256	5,453,322
Talco, Franklin-Titus	13,470	147,779,624
R.R.C. Dist. 7-B:		
Brown County, Regular	1,465	35,472,733
Callahan County, Regular	1,146	17,614,200
Coleman County, Regular	1,143	15,204,878
Eastland County, Regular	1,564	112,757,666

Texas Oilmanac Data

5,000,000 Bbl. Fields (continued)

Field and county—	1954 B/D	Cumulative Jan. 1, 1955
Fisher County, Regular		12,144,290
Round Top (Palo Pinto Reef), Fisher	4,001	11,296,649
Jones County, Regular	1,841	23,707,525
Avoca, Jones	647	6,593,737
Griffin, Jones	635	6,934,638
Wimberly, Jones	120	5,060,420
Palo Pinto County, Regular	499	6,785,279
Shackelford County, Regular	3,182	57,684,339
Stephens County, Regular	2,917	148,189,254
Katz, Stonewall	5,821	5,686,391
Reddin, Taylor	506	6,701,398
Throckmorton County, Throckmorton	1,632	17,004,461
R.R.C. Dist. 7-C:		
Barnhart, Reagan	1,318	13,000,691
Benedum (Spraberry), Upton-Reagan	4,315	7,733,951
Big Lake, Reagan	2,233	113,013,125
Cree-Sykes (Upper Gardner), Runnels	3,536	5,894,994
Fort Chadbourne, Runnels-Coke	14,238	14,927,043
Hulldale (Penn. Reef), Schleicher	4,208	5,180,094
Jameson, Coke	6,248	12,963,442
McCamey, Upton	6,584	94,703,441
Pegasus (Ellenburger), Upton-Midland	10,312	16,434,898
Pembrook, N. (Spraberry), Upton-Reagan		5,867,690
Spraberry Trend Area, Reagan-Upton	42,476	23,735,575
Susan Peak, Tom Green	1,777	5,446,318
Todd Deep (Crinoidel), Crockett	1,230	5,571,426
Todd Deep (Ellenburger), Crockett	5,568	23,314,001
Vaughn, Crockett	2,109	5,994,897
Weiner-Floyd (Spraberry), Upton		5,873,161
Wilshire (Ellenburger), Upton	9,507	12,390,298
World, Crockett	3,628	20,850,243
R.R.C. Dist. 8:		
Adair, Terry	1,933	6,378,131
Adair (Wolfcamp), Terry	4,549	6,340,126
Andector (Ellenburger), Ector	15,071	38,661,441
Anton-Irish, Hale-Lamb	7,067	16,791,966
Apco-Warner, Pecos	966	6,767,758
Block 31 (Devonian), Crane	13,468	22,061,583
Cedar Lake, Gaines	4,265	14,299,561
Church Fields, Crane-Upton		13,008,502
Cogdell Area, Kent-Scurry	17,957	32,411,235
Cowden, North, Ector	12,465	105,772,764
Cowden, N. (Deep), Ector	2,621	7,912,423
Cowden, S., Ector	6,999	27,333,081
Diamond "M" (Canyon Lake Area), Scurry	23,663	49,550,814
Dollarhide (Clearfork), Andrews	5,995	7,922,162
Dollarhide (Devonian), Andrews	6,129	15,694,204
Dollarhide (Ellenburger), Andrews	2,092	9,955,006
Dollarhide (Silurian), Andrews	4,171	11,729,759
Driver (Spraberry), Midland		9,249,942
Embar (Ellenburger), Scurry	2,495	13,003,356
Emma, Andrews	876	8,675,225
Emperor, Winkler	631	6,903,551
Estes, Ward		17,777,706
Fort Stockton, Pecos	3,531	5,445,172
Foster, Ector	10,101	81,705,363
Fuhrman-Mascho, Andrews	3,673	18,821,301
Fullerton, Andrews	11,465	82,221,141
Fullerton (8,500-ft. sand), Andrews	3,681	15,254,676
Fullerton (Wichita-Albany), Andrews		5,374,908
Garza, Garza	7,749	24,203,443
Goldsmith, Ector	14,049	125,676,645
Goldsmith (Clearfork), Ector	5,852	18,153,597
Goldsmith (5,600-ft.), Ector	18,138	37,627,010
Good, Borden	3,536	8,492,893
Harper, Ector	644	11,984,130
Henderson, Winkler	266	13,708,416
Hendricks, Winkler	3,681	224,460,154
Howard-Glasscock, Howard-Glasscock	20,178	171,580,006
Iatan, East Howard, Mitchell-Howard	3,016	29,571,108
Johnson, Ector	832	10,246,626
Jordan, Crane	3,891	28,597,595
Jordan (Ellenburger), Ector	3,638	7,604,619
Kelly-Snyder, Scurry	52,999	116,917,834
Kermit, Winkler	5,054	43,007,948
Keystone (Colby sand), Winkler	3,725	17,019,309
Keystone (Devonian), Winkler	1,766	9,707,644
Keystone (Ellenburger), Winkler	14,112	73,611,254
Keystone-Holt, Winkler	2,401	14,024,063
Keystone Lime, Winkler	431	8,409,224
Keystone (Silurian), Winkler	2,060	7,399,028
Levelland, Cochran-Hockley	26,898	74,590,610
Mabee, Andrews	2,620	10,703,276
Martin (Ellenburger), Andrews	4,832	16,996,573
McElroy, Crane-Upton	18,301	131,344,857
Means, Andrews	3,655	23,632,062
Midland Farms, Midland	11,317	31,011,418
Payton, Pecos-Ward	1,404	5,913,987
Penwell, Ector	1,692	32,834,392
Prentice, Yoakum	7,165	5,337,466
Reinecke, Borden	4,491	11,559,639
Russell, Gaines	3,952	6,370,683
Salt Creek, Kent	9,224	12,208,096
Sand Hills (McKnight), Crane	3,756	7,276,142
Sand Hills (Ordovician), Crane	629	5,197,957
Sand Hills (Tubb), Crane	6,457	37,459,086
Scarbrough, Winkler	327	8,034,131
Seminole (San Andres), Gaines	11,869	79,226,013
Seminole, W., Gaines	2,522	5,234,495
Shafter Lake (Devonian), Andrews	3,183	10,816,626
Sharon Ridge (1,700-ft.), Scurry-Mitchell	2,537	8,094,117
Shipley (Queen sand), Ward	791	9,033,225
Slaughter, Cochran-Terry-Hockley	31,051	210,491,199
Snyder, N., Scurry		5,694,904
Spraberry Trend Area, Midland-Glasscock	26,203	16,831,850
Taylor Link, Pecos	567	11,916,506
Tex Harvey (Floyd sand), Midland-Glasscock		13,443,072
Three Bar (Devonian), Andrews	3,424	9,334,010
Toborg, Pecos	3,537	25,226,687
Tunstill, Reeves	1,669	6,744,634
TXL (Devonian), Ector	3,869	37,466,064
TXL (Ellenburger), Ector	14,463	77,948,257
University Waddell (Ellenburger), Crane	1,169	5,172,109
Vealmoor, Howard	4,561	9,112,021
Vealmoor, East, Borden-Howard	5,280	10,514,688
Waddell, Crane	3,145	18,441,532
Ward, North Estes, Winkler	9,058	51,537,536
Ward, South, Ward	12,624	55,848,344
Wasson, Gaines & Yoakum	42,239	267,513,256
Welch, Dawson	2,770	21,315,952
Wellman, Terry	3,057	6,021,522
Westbrook, Mitchell	1,402	16,130,041
Wheat, Loving	1,107	12,751,059
Wheeler (Devonian), Winkler	801	7,786,098
Wheeler (Ellenburger), Winkler	2,124	13,346,867
Yarbrough & Allen, Ector	5,446	11,085,845
Yates, Pecos	26,579	419,724,306
R.R.C. Dist. 9:		
Archer County, Regular	8,672	163,278,680
Hull-Silk-Sikes, Archer	3,794	46,464,718
Mankins, Archer	128	7,551,914
Baylor County, Regular	404	6,280,011
Clay County, Regular	2,198	22,997,063
Antelope, Clay	700	7,840,652
Joy (Strawn), Clay	1,867	7,444,896
Cooke County, Regular	3,517	37,667,800
Sivells Bend, Cooke	2,281	9,806,610
Walnut Bend, Cooke	2,927	19,433,149
Walnut Bend (Hudspeth), Cooke	2,252	5,330,662
Walnut Bend (Winger), Cooke	1,885	5,389,979
Sherman, Grayson	2,149	5,754,103
Jack County Regular	1,349	24,585,556
Bryson, E., Jack	891	6,738,420
Worsham-Steed, Jack	2,135	6,403,746
Montague County, Regular	3,785	13,697,041
Hildreth Pool, Montague	798	12,454,873
Wichita County, Regular	17,572	387,246,507
K.M.A., Wichita	5,279	84,932,219
K.M.A. (Ellenburger), Wichita	313	16,304,332
Wilbarger County, Regular	6,243	98,921,241
Fargo, Wilbarger	2,578	10,137,153
Young County, Regular	5,350	97,834,044
R.R.C. Dist. 10:		
Carson County	8,499	61,524,464
Gray County	34,776	207,852,832
Hutchinson County	33,591	168,281,856
Wheeler County	3,140	17,074,190

4¼ Trillion Feet of Marketed Gas

. . . that was Texas' score in '54—nearly half of nation's total

by Paul Swain
Staff Writer

TEXAS TODAY

TEXAS, the largest producer of natural gas in this country, is still her best single customer.

Faced with the very unpopular prospect of having the federal Government tell him what he can do with his gas and what price he can receive for it, the Texas natural-gas producer would be very happy if more of his gas were used in Texas. Unless federal legislation relieves the Texas producer from the burden of U. S. control, more of it will be consumed in Texas.

In 1954, the United States produced 9,426,509,000 M.c.f. of natural gas. Texas accounted for 5,510,661,968 M.c.f. of that total—more than 58 per cent.

Last year, 8,667,000,000 M.c.f. of the gas produced in this country was marketed. Texas sold 4,268,562,848 M.c.f., or more than 49 per cent of all the natural gas that was marketed in the United States.

In addition to that, Texas holds more than 49 per cent of this country's proved natural-gas reserves within its borders.

These figures—like Texas itself—are impressive. They provide the key to the Texas point of view toward federal control. Texans don't care for the idea at all.

Last year Texas exported 2,365,061,804 M.c.f. of its gas to other states. But, 1,903,501,044 M.c.f. besides that was used by Texas industry and for Texas home heating. It never left the state.

Gas experts say that today there is a gas supply of more than 500,000,000 M.c.f. in the Gulf Coast area of Texas alone that is or will be available for use—but only in an unregulated market. That means a market in which Uncle Sam has no say so.

The consternation which struck the natural-gas industry in general with the Supreme Court decision in the Phillips case has been accented in Texas. Every action taken by the Federal Power Commission since that decision has been felt more in Texas than any place else. That's only natural in view of the Texas position in natural gas.

Producers who are able to do so are not selling natural gas to interstate gas transmission lines. They are regarded enviously by producers who have little choice. Many producers are forced to sell their gas because they are bound to market any gas they find by the contractual obligations they have with landowners.

Action Slows Search

Not many companies will admit it, but few of them are as active in their search for natural gas as they were a year ago. The specter of federal control has slowed down the hunt for new gas supplies in cases where there is no other controlling factor.

Hines Baker, president of Humble Oil & Refining Co., recently told his shareholders:

"The uncertainty of future gas prices has made it unwise for Humble and other producers in recent months to make extensive sales of gas in interstate commerce for resale."

Last year, Humble sold 335,111,000 M.c.f. of natural gas. This was an increase of about 6 per cent over the volume of gas sold in 1953. Baker said the value of the gas marketed by Humble rose 13 per cent over 1953. Baker said some additional sales contracts were made early in the year and some escalation clauses in old contracts went into effect, but he added the future of interstate gas sales has been "clouded" by the FPC.

Any gas producer who can weather out the storm and not sell his gas in interstate commerce is regarded as fortunate in Texas. Most of them are bound both to search for oil—and the gas that accompanies it—and to produce it if it is found. Lease obligations will not allow them to wait for Congress to settle the natural-gas situation.

"We've got to go ahead and drill," one producer comments. "If we don't we just lose our leases and someone else comes along, takes over the lease, drills, produces the gas, and sells it—federal control or no federal control."

He compares the Texas natural-gas producer to the Kansas wheat farmer who for years is faced with an annual wheat surplus.

"That Kansas wheat farmer is going to plant wheat and harvest it even if the Government's elevators are overflowing with wheat. He's going to plant wheat and harvest it because he has to, to live.

"Gas producers are the same. They have to drill and produce oil and gas to live. They're going to keep right on as long as they have to."

This philosophy is predominant among Texas oil and gas men. That's why they can't grasp any other philosophy voiced in the halls of Congress that gas prices might get out of hand. It simply isn't possible to them.

Once the price of natural gas to the consumer reaches the stage where it is no longer competitive with fuel oil or coal in the gas-consuming areas of the East, gas prices will have to come down. Otherwise its users will turn to the other fuels. Why then, Texans ask, can anyone be worried about gas prices going too high for the consumer?

The effort to obtain legislation to relieve natural gas of this burden of federal control has almost united the two opposite poles of the gas industry—the producers and the long-line transmission people.

Instead of facing each other over a haggling table and dickering on price, the two groups have found themselves closely aligned in the congressional battle to insure they have the right to be on opposite sides of that table. But they still differ on other gas questions.

Gas-transmission people in Texas are inclined to shrug off any idea that Texas producers can hold gas off the market. They have only to point to expansion and looping of the lines which originate in Texas and extend to eastern markets. In order to expand those lines, the transmission companies have to have more gas to move through them. They are getting it. They are getting it from the gas producer who is selling his gas whether he'd rather sit tight or not.

Tennessee Gas Transmission Co., one of the largest transporters of gas, and one that is still getting larger, applied 60 days ago for an FPC permit to expand its gathering system in South Texas and Louisiana and add to its transmission line. Accompanying that application were more than 80 new purchase contracts for natural gas.

TEXAS TODAY

Most of them were made with Texas gas producers.

There are nearly as many prices paid for natural gas in Texas as there are fields. The price the purchaser pays depends on the location of the gas and to a very large extent how much of it is available in one area.

One gas authority believes that 16 cents per M.c.f. is pretty close to tops for a large supply of gas in the Texas Gulf Coast area. There are contracts paying more than that, but the 16-cent figure is regarded as a realistic top price for gas in one of Texas' most prolific areas.

In the Texas Panhandle, prices do not even approach that figure. The Texas Railroad Commission found in its May survey that average Panhandle gas prices have risen 14 per cent over 1953, but they are still at 8.71 cents per M.c.f. for gas at 14.65 psi. and 9.75 cents per M.c.f. for gas at 16.4 psi.

The Railroad Commission does not have the authority to set gas prices, but it surveys gas prices twice a year to determine the going price of Texas Panhandle gas.

Natural gas was first produced commercially in Texas about 1900, some 30 years after the first "long-distance" gas-transmission line carried gas to Rochester, N. Y. *(The Oil and Gas Journal, May 16, page 146).*

Corsicana was the first city in Texas to use natural gas and it was not until 1910 that both Fort Worth and Dallas

Texas Oilmanac Data

ULTIMATE DISPOSITION OF ALL REPORTED GAS PRODUCTION—TEXAS

	1954		1953		1952		1951		1950	
	M.M.c.f.	Per cent of total	M.M.c.f.	Per cent of total	M.M.c.f.	Per cent of total	M.M.c.f.	Per cent of total	M.M.c.f.	Per cent of total
Extraction loss*	192,718	3.5	184,632	3.5	174,260	3.4	161,987	3.5	140,705	3.5
Plant fuel and lease use	430,078	7.8	414,112	7.8	381,864	7.5	355,948	7.6	335,288	8.3
Press. maint. and repress.	302,105	5.5	287,147	5.4	273,845	5.4	295,699	6.3	316,630	7.9
Transmission lines	3,681,109	66.8	3,440,991	64.7	3,199,003	62.9	2,750,334	58.9	2,180,986	54.2
Cycled	490,484	8.9	491,907	9.3	511,047	10.0	561,232	12.0	573,490	14.2
Carbon black	157,376	2.9	197,030	3.7	258,985	5.1	332,129	7.1	306,421	7.6
Gas lift					105,154	2.1	168,780	3.6	142,510	3.5
Vented	255,273	4.6	297,296	5.6	184,424	3.6	47,426	1.0	28,424	0.07
Plant meter difference	1,518	0.03	1,655	0.03	795	0.02				
Total gas reported	5,510,662		5,314,771		5,089,377		4,673,535		4,024,184	
Marketed production†	4,268,563		4,052,133		3,839,852		3,418,411		2,822,695	

*Shrinkage in gas volume due to removal of liquefiable hydrocarbons plus acid gas and H_2S extraction. †Total gas to "transmission lines," "carbon black," and "plant fuel and lease use."

GAS WELL GAS PRODUCTION AND INITIAL DISPOSITION IN TEXAS
(M.M.c.f.)

	1954	1953	1952	1951	1950
Wells (av.)	10,692	9,695	8,899	7,859	6,999
Gas well gas produced	3,955,493	3,835,636	3,779,107	3,518,486	3,099,606
Fuel system and lease use	59,898	63,082	61,594	59,048	61,693
Gas lift	70,430	78,422	79,338	86,552	79,045
Press. maint. and repress.	6,970	8,008	13,093	17,519	25,646
Transmission lines	1,056,307	1,006,091	979,070	839,588	659,455
Processing plants	2,741,931	2,658,388	2,614,184	2,474,606	2,252,175
Carbon-black plants	15,413	18,289	28,591	39,099	21,099
Vented	4,545	3,356	3,237	2,074	493

REPORTED CASING-HEAD GAS PRODUCTION AND INITIAL DISPOSITION
(M.M.c.f.)

	1954	1953	1952	1951	1950
Wells reporting production (average)	105,653	97,594	85,505	75,420	72,097
Casing-head gas produced	1,555,169	1,479,135	1,310,270	1,155,050	924,571
Total gas well gas and residue gas used for gas lift	171,077	177,958	59,830		
Total	1,726,246	1,657,093	1,370,100	1,155,050	924,571
Fuel system and lease use	72,096	63,230	46,583	33,644	31,477
Gas lift				14,935	9,316
Press. maint. and repress. plants (nonprocessing)	36,909	40,501	62,746	76,844	91,603
Transmission lines	136,213	101,761	91,671	96,258	75,198
Processing plants	1,246,755	1,185,139	1,019,516	913,923	703,546
Carbon-black plants	7,282	9,452	9,777	9,697	8,321
Vented or flared	226,991	257,010	139,807	9,749	5,110

GAS EXPORTED FROM TEXAS—YEAR 1954
(Per cent of increase over 1953 = 6.61)

Company—	M.M.c.f.
Arkansas Louisiana Gas Co.	36,547
Border Pipe Line Co.	4,131
Cities Service Gas Co.	39,735
Colorado Interstate Gas Co.	123,223
Consolidated Gas Util. Corp.	11,505
El Paso Natural Gas Co.	266,405
Lone Star Gas Co.	671
Michigan-Wisconsin Pipe Line Co.	110,845
Mississippi River Fuel Corp.	19,271
Natural Gas Pipe Line Co. of Amer.	107,206
Northern Natural Gas Co.	149,554
Panhandle Eastern Pipe Line Co.	124,536
Public Service Corp. of Texas	377
Reynosa Pipe Line Co.	13,213
Southern Natural Gas Co.	10,204
Southern Union Gas Co.	547
Southwestern Public Service Co.	114
Spearman Gas Co.	71
Tennessee Gas Trans. Co.	496,990
Texas Eastern Trans. Corp.	258,110
Texas Gas Trans. Corp.	67,327
Texas Gas Utilities Co.	745
Texas Illinois Nat. Gas Pipe Line Co.	155,291
Trans/Cont. Gas Pipe Line Corp.	156,775
Trunkline Gas Co.	65,869
United Gas Corp.	801
United Gas Pipe Line Co.	144,976
Wheeler Gas Co.	9
Total	2,365,048

LIQUID HYDROCARBONS FROM TEXAS GAS WELLS
(Includes products of gasoline and other gas-processing plants)

Year	Barrels				
	Cond. and crude oil	Natural gasoline	Propane and butane	Other products	Total
1940	5,893,816	21,787,232	4,659,598	295,463	32,636,019
1941	7,461,913	25,154,257	5,855,450	650,276	39,121,896
1942	8,394,835	26,702,733	5,833,009	1,311,380	42,241,957
1943	9,698,028	27,717,706	6,678,716	1,453,044	45,547,494
1944	11,391,422	33,027,951	8,519,748	1,299,844	54,238,965
1945	10,417,136	37,915,053	10,189,384	1,217,324	59,728,897
1946	10,955,463	40,539,242	12,642,206	1,059,220	65,196,131
1947	11,032,885	42,254,559	18,336,669	1,508,429	73,232,542
1948	13,408,053	48,573,752	21,615,134	1,836,902	85,433,841
1949	15,431,347	52,861,792	23,802,582	2,181,644	94,277,365
1950	19,410,637	60,463,927	33,476,107	2,644,511	115,725,182
1951	21,160,349	66,235,676	41,593,866	2,508,761	131,498,652
1952	22,713,621	70,587,064	46,200,153	3,679,016	143,179,854
1953	24,787,811	74,461,500	50,762,331	3,485,832	153,497,474
1954	26,099,588	76,321,212	57,136,095	3,548,193	163,105,088

PRESSURE-MAINTENANCE AND REPRESSURING-PLANT OPERATIONS (NONPROCESSING) IN TEXAS

	1954	1953	1952	1951	1950
Number of plants (av.)	133	144	150	148	149
Intake (M.M.c.f.):					
Gas-well gas	6,970	8,008	9,666	9,472	892
Casing-head gas	36,909	40,500	36,490	30,064	6,933
Residue gas	9,233	4,319	4,389	4,199	7,189
Pipelines	3,364	3,679	3,246	747	25,330
Total	56,476	56,506	53,791	44,482	40,344
Disposition (M.M.c.f.):					
Plant fuel and lease use	2,433	2,979	3,095	2,884	1,994
Gas lift	4,845	4,624	3,004	3,003	2,175
Press. maint. and repress.	45,229	41,098	44,730	37,606	34,841
Transmission lines	2,370	5,712	1,741	299	1,334
Vented or flared	1,599	2,093	1,221	690	0
Total	56,476	56,506	53,791	44,482	40,344
No. of injection wells (av.)	465	488	520	485	492

(Source: Railroad Commission of Texas Form PM-1.)

CARBON-BLACK-PLANT OPERATIONS IN TEXAS

	1954	1953	1952	1951	1950
Number of plants (av.)	20	27	32	35	38
Gas used for carbon black (M.M.c.f.)	157,376	197,030	258,609	307,548	306,421
Gas used for other purposes (M.M.c.f.)	2,899	4,550	4,779	5,433	5,814
Carbon-black manufacturing (1,000 lb.)	454,145	540,586	643,539	729,197	683,988
Carbon black in storage, av. (1,000 lb.)	197,208	217,094	188,133	81,685	87,710
Carbon black (lb. per M.c.f.)	2.88	2.74	2.49	2.37	2.23

(Source: Railroad Commission of Texas Form GCB-1.)

TEXAS NATURAL-GAS PRODUCTION AND INITIAL DISPOSITION, 1954
(Gas volumes in M.c.f.)

Gas Well Gas

No. of wells, Jan. 1, 1955 11,224

Disposition—	Volume	Per cent of total
Fuel system and lease use	59,897,508	1.6
Gas lift	70,429,799	1.7
Pressure maintenance and repressure	6,969,563	0.2
Transmission lines	1,056,306,502	26.7
Processing plants	2,741,931,440	69.3
Carbon-black plants	15,413,355	0.4
Vented	4,544,644	0.1
Total	3,955,492,811	100.0

Casing-Head Gas

No. of wells January 1, 1955 109,092

Disposition—	Volume	Per cent of total
Fuel system and lease use	72,095,901	4.2
Pressure maintenance and repressure	36,908,949	2.1
Transmission lines	136,212,573	7.9
Processing plants	1,246,755,408	72.3
Carbon-black plants	7,282,471	0.4
Vented or flared	226,991,046	13.1
Total	1,726,246,348	100.0

were supplied with gas. Lone Star Gas Co. built the first large-diameter, long-distance, natural-gas pipeline from Petrolia field to supply these two cities, 130 miles away.

Today, no city of any size in Texas is without it. The state's gas-transmission lines cross and recross the state in so many places they form a veritable web across the face of Texas.

Texas gas fields not only lead the roster of gas fields in the United States, but they dominate any list. Texas has 10 of the 12 biggest gas fields in the United States. They are familiar names to the oil industry, names like Panhandle, Hugoton, Carthage, LaGloria, Agua Dulce, Katy, Old Ocean, Seeligson, Sheridan, Pledger, and others.

In addition to these, the immense gas reserves conceded to lie in subsea areas off the Texas Gulf Coast have not yet been tapped.

In spite of its past records in natural gas, Texas is still making new ones. Of the 20,123 wells drilled in the state in 1954, 1,119 were gas producers. Producers reported to the Railroad Commission that they produced 5,510,661,968 M.c.f. of gas during the year. Of that total 3,955,000,000 M.c.f. came from gas wells and another 1,555,000,000 cu. ft. was produced in connection with oil.

The state has more than 200 natural-gasoline plants. These plants processed 3,998,686,848 M.c.f. of gas in 1954 and produced 137,005,500 bbl. of liquid products. Of this total, 76,321,212 bbl. was natural gasoline, 57,136,095 bbl. was propane and butane, and 3,548,193 bbl. in other products. Another 26,099,588 bbl. of liquid products from natural gas was produced by separators and gas-processing facilities smaller than gasoline plants.

(See following two pages for tables on processing and cycling-plant operations in Texas).

Processing-Plant Operations in Texas

	1954			1953			1952			1951			1950		
PLANTS AND WELLS (avg.):															
Gasoline plants, No.	189			179			169			170			188		
Press. Maintenance plants, No.	22			22			25								
Other plants,* No.	207			160			130			126			88		
Total plants	418			361			324			296			276		
Wells produced, No.:															
Gas wells	5,432			4,678			4,011			3,819			3,228		
Oil wells	67,317			65,186			62,586			60,046			58,630		
Total wells	72,749			69,864			66,597			63,883			61,858		
	Gas-well gas¶	Casing-head	Total	Gas-well gas¶	Casing-head	Total	Gas-well gas¶	Casing-head	Total	Gas-well gas¶	Casing-head	Total	Gas-well gas¶	Casing-head	Total
INTAKE (M.M.c.f.):															
Gas into gathering system†	1,994,641	1,171,367	3,116,008	1,848,134	1,106,838	2,954,972	1,678,441	975,434	2,653,875						
Deliveries from gathering system	297,770	24,721	322,491	293,734	23,635	317,369	113,573	20,229	133,802						
Gas to plants for processing	1,646,871	1,146,646	2,793,517	1,554,400	1,083,203	2,637,603	1,564,868	955,205	2,520,073	1,588,817	870,180	2,458,997	1,401,886	726,017	2,127,902
Refinery	0	0	3,554	0	0	4,587	0	0	8,793	0	0	10,127	0	0	7,425
Other sources	0	0	877,872	0	0	776,453	0	0	583,010	0	0	165,089	0	0	111,338
Total to plants			3,674,943			3,418,643			3,111,876			2,634,213			2,246,665
	—Unprocessed— Gas-well gas	Casing-head	Residue	—Unprocessed— Gas-well gas	Casing-head	Residue	—Unprocessed— Gas-well gas	Casing-head	Residue	—Unprocessed— Gas-well gas	Casing-head	Residue	—Unprocessed— Gas-well gas	Casing-head	Residue
DISPOSITION (M.M.c.f.):															
Extraction loss			153,988			144,621			135,346			128,259			113,097
Acid gas			5,892			6,222			3,152						
Plant-lease-fuel system	7,370	3,900	234,136	6,493	4,938	222,330	2,433	1,303	214,577			207,712			191,576
Gas lift	10,800	2,169	73,451	9,894	3,634	71,602	1,851	1,605	71,365			57,015			46,401
Repress. and press. maintenance	190	0	243,219	146	0	226,638	443	161	183,345			198,006			203,937
Carbon black	199	0	118,964	0	0	154,998	8	4	207,853			252,697			269,520
Other plants	245,549	9,040	72,162	245,456	4,587	28,071	85,428	9,425	17,678						
Transmission lines	33,581	1,208	2,760,278	31,670	1,531	2,539,656	23,404	982	2,248,094			1,758,136			1,401,551
Vented or flared	80	8,404	11,352	75	8,945	23,573	6	6,749	30,038			32,388			20,583
Meter difference‡			1,501			932			428						
Total	297,769	24,721	3,674,943	293,734	23,635	3,418,643	113,573	20,229	3,111,876			2,634,213			2,246,665
PLANT PRODUCTION (bbl.):															
Condensate and crude		7,467,318			6,897,997			5,656,747			4,255,654			3,627,121	
Gasoline		63,901,795			61,259,936			56,204,268			52,212,364			47,522,567	
Butane-propane		46,329,576			39,359,614			34,483,367			31,371,931			26,682,601	
Other products		1,394,518			1,467,596			1,503,225			889,892			1,401,253	
Total		119,093,207			108,985,143			97,847,607			88,729,841			79,233,542	
IMPORTED FROM OTHER STATES§ (M.M.c.f.):															
Oklahoma		34,227			32,278			27,834			31,247			19,095	
Louisiana		5,652			4,351			4,274			5,062			3,307	
Total		39,879			36,629			32,108			36,309			22,402	

*Includes separators, dehydrating plants, and all plants processing gas for the extraction of hydrocarbon liquids. Also drips and scrubbers; gas volumes through drips and scrubbers not included (liquid recovered only).

†Total production of wells connected to plants plus or minus any meter differences shown on Form GP-1.

‡Meter difference that occurs within the plants.

§Included in "Other Sources" in the "Intake" section.

¶The sweet and sour figures were combined because of the relatively small difference in value between these gases as a result of the new desulfurization processes.

Source: Railroad Commission of Texas Form GP-1.

Cycling-Plant Operations in Texas

	1954			1953			1952			1951			1950		
PLANTS AND WELLS (avg.):															
Cycling plants, No.	31			32			33			33			34		
Wells producing, No.:															
Gas wells	693			634			601			556			514		
Oil wells	1,859			1,906			1,821			1,705			921		
Total wells	2,552			2,540			2,422			2,261			1,435		
	Gas-well gas	Casing-head	Total	Gas-well gas	Casing-head	Total	Gas-well gas	Casing-head	Total	Gas-well gas	Casing-head	Total	Gas-well gas	Casing-head	Total
INTAKE (M.M.c.f.):															
Gas into gathering system*	797,290	74,394	871,684	810,241	78,513	888,754	864,326	79,723	944,049						
Deliveries from gathering system	17,440	2,211	19,651	19,804	2,192	21,996	6,220	496	6,716						
Gas to plants for processing	779,850	72,183	852,033	790,437	76,321	866,758	858,106	79,227	937,333	822,636	80,899	903,535	781,316	51,696	833,012
Refinery vapors	0	0	17	0	0	22	0	0	24	0	0	0	0	0	0
Other sources	0	0	67,105	0	0	56,674	0	0	29,130	0	0	8,404	0	0	2,952
Total			919,155			923,454			966,487			911,939			835,964
	——Unprocessed——			——Unprocessed——			——Unprocessed——			——Unprocessed——			——Unprocessed——		
	Gas-well gas	Casing-head	Residue	Gas-well gas	Casing-head	Residue	Gas-well gas	Casing-head	Residue	Gas-well gas	Casing-head	Residue	Gas-well gas	Casing-head	Residue
DISPOSITION (M.M.c.f.):															
Extraction loss			32,839			33,759			35,761			33,728			27,552
Plant-lease-fuel system	106	115	48,221	299	215	47,823	1	0	49,934			48,496			42,149
Gas lift	846	345	8,103	854	465	8,804	142	56	8,734			7,302			5,546
Repress. and press. maintenance	0	0	20,469	0	0	19,352	0	0	18,124			12,472			0
Cycled	287	0	490,197	0	0	491,907	0	0	511,047			561,058			573,490
Carbon black plants	0	0	8,847	0	0	9,311	0	0	9,293			9,321			2,229
Transmission lines	16,199	0	310,367	18,651	20	311,095	6,077	0	332,053			237,201			175,735
Vented or flared	1	1,752	481	0	1,492	679	0	440	1,173			2,361			9,263
Meter difference†			17			724			368						
Total	17,439	2,212	919,541	19,804	2,192	923,454	6,220	496	966,487			911,939			835,964
PLANT PRODUCTION (bbl.):															
Condensate crude		1,811,059			1,743,627			1,790,880			2,023,857			2,449,579	
Gasoline		12,630,959			13,201,564			14,379,835			14,030,585			12,765,362	
Butane-propane		10,851,561			11,399,717			11,701,437			10,221,936			7,128,190	
Other products		2,153,799			2,018,231			2,175,791			1,618,881			1,250,147	
Total		2,447,378			28,363,139			30,047,943			27,895,259			23,593,278	

*Total production of wells connected to plants plus or minus any meter difference between the wells and the plants.

†Meter difference that occurs within the plants.

Source: Railroad Commission of Texas Form GP-1.

Table 1—Crude-Oil-Pipeline Mileage in Texas

(In miles)

Pipeline company and address	Trunk lines: 0 to 8-in.	Trunk lines: Above 8-in.	Trunk lines: Net addition	Gathering lines: 0 to 6-in.	Gathering lines: 7 to 12-in.	Gathering lines: Above 12-in.	Gathering lines: Net addition	Total mileage gathering and trunk
American Liberty Pipe Line Co.: Dallas	0	0	0	62.95	102.83	0	12.87	165.78
American Petroleum Co.: Houston	44.13	11.91	0	39.88	50.74	0	0.31	146.66
Arkansas Pipe Line Co.: Shreveport	8.69	47.39	0	21.55	15.12	0	0.13	92.75
Atlantic Pipe Line Co.: Dallas	148.27	1,580.20	52.57	342.13	116.49	0.27	6.29	2,187.36
Bell General Pipe Line Co.: Dallas	1.64	37.90	0	82.95	45.83	0	1.08	168.32
Cities Service Pipe Line Co.: Bartlesville, Okla.	9.94	146.47	59.32	189.30	19.01	0	6.04	364.72
Continental Pipe Line Co.: Ponca City, Okla.	0	0	0	866.00	0	0	N.A.	866.00
Cordele Pipe Line Co.: Houston	8.33	0	0	4.46	0	0	0.28	12.79
Crown Central Pipe Line & Transportation Corp.: Houston	34.72	5.38	0	26.04	1.44	0	N.A.	67.58
Duval Pipe Line Co.: Pittsburgh	65.30	0	0	45.11	2.07	0	0.38	112.48
Gulf Refining Co., Southern Pipe Line Division: Houston	687.92	3,423.00	—14.42	1,252.07	570.62	0.07	1.44	5,933.68
Humble Pipe Line Co.: Houston	664.84	5,061.02	—32.41	2,681.56	689.21	2.37	—24.59	9,099.00
Illinois Pipe Line Co. of Texas: Findlay, Ohio	0	0	0	87.64	46.91	0.35	2.31	134.90
Keystone Pipe Line Co.: Philadelphia	44.01	98.24	N.A.	0	0	0	0	142.25
Magnolia Pipe Line Co.: Dallas	383.97	4,506.58	171.75	1,868.67	461.27	0	33.63	7,220.49
Mid-Valley Pipe Line Co.: Longview, Tex.	0	47.80	0	0	0	0	0	47.80
Nantucket Pipe Line Co.: Houston	0.41	459.83	0.20	0	0	0	0	460.24
Pan Americaan Pipe Line Co.: Houston	39.56	498.99	—47.36	497.88	303.47	1.44	129.35	1,341.34
Pasotex Pipe Line Co.: El Paso	22.40	663.75	151.47	107.57	41.77	0.07	—31.92	835.56
Phillips Pipe Line Co.: Bartlesville, Okla.	544.67		N.A.	614.66	246.97	1.20	136.85	1,407.50
Plains Pipe Line Co.: Bartlesville, Okla.	0.12	49.42	0	281.07	74.67	0	50.33	405.28
Pure Transportation Co.: Chicago	6.03	229.01	0	9.59	46.91	0	—0.02	291.54
Republic Pipe Line Co.: Pittsburgh	88.29	15.29	0	81.41	14.13	0.05	5.26	199.17
Service Pipe Line Co.: Tulsa	43.12	1,552.79	40.71	1,454.05	366.76	0.01	51.42	3,416.73
Shell Pipe Line Corp.: Houston	607.62	955.99	174.14	727.06	373.78	0.65	38.34	2,665.10
Sinclair Pipe Line Co.: Independence, Kans.	235.43	1,664.81	—353.61	2,011.94	386.14	17.56	155.83	4,315.88
Sohio Pipe Line Co.: St. Louis	0	0	0	0	24.59	0	24.59	24.59
Sun Pipe Line Co.: Philadelphia	200.43	529.48	1.59	509.72	352.20	1.61	37.12	1,593.44
Southern Pipe Line Corp.: Corpus Christi, Tex.	164.96	8.01	0	275.34	20.39	0	5.21	468.70
Texas-New Mexico Pipe Line Co.: Houston	214.73	957.71	—0.57	565.86	238.37	4.59	73.49	1,981.26
Texas Pipe Line Co.: Houston	342.35	1,081.80	9.37	1,335.84	337.17	0	6.55	3,097.16
Tidal Pipe Line Co.: Tulsa	0.15	20.18	0	100.24	43.52	0	0.11	164.09
West Texas Gulf Pipe Line Co.: Houston	0	576.51	0	0	0	0	0	576.51
Wheeler Pipe Line Co.: Shamrock, Tex.	7.91	0	0	1.15	0	0	0.74	9.06
Yount-Lee Pipe Line Corp.: Houston	0	0	0	24.83	16.14	0	0.42	40.97
Subtotal	4,075.27	24,774.13	212.45	16,168.52	5,008.52	30.24	723.80	
Total trunk lines	28,849.40							
Total gathering lines	21,207.28							
Total crude lines	50,056.68							

N.A.—Not available.

TEXAS TODAY

A Billion Dollars and 83,000 Miles

. . . A quarter of the nation's pipeline mileage is within Texas. These tables show companies owning that mileage, the sizes involved, and the dollar investment.

by Robert G. Deering

OVER a billion dollars invested in 83,000 miles of oil and gas lines—that's Texas' pipeline industry. The largest portion of this mileage and investment is for crude-oil-gathering and trunk systems. Table 1 shows crude lines totaling over 50,000 miles.

Table 2 shows gas-pipeline mileage, exclusive of distribution systems, totaling 22,000 miles. The amount of gas-pipeline mileage has doubled within the last 10 years, testifying to the rapid growth of that industry.

Not included in either table are the estimated 3,000 miles of products lines or the estimated 6 to 8 thousand miles of gas lines feeding the state's 227 field processing and recycling plants. These figures bring the estimated total to over 83,000 miles.

Big crude-pipeline systems . . . Ten companies in Texas have over 78 per cent of the total crude mileage. In fact, one company, Humble Pipe Line Co., owns 18 per cent of the total—9,099 miles. The next nine largest, in order of mileage, are: Magnolia Pipe Line Co., Gulf Refining Co., Sinclair Pipe Line Co., Service Pipe Line Co., The Texas Pipe Line Co., Shell Pipe Line Co., Atlantic Pipe Line Co., Texas New Mexico Pipe Line Co., and Sun Pipe Line Co.

These 10 companies have 41,500 miles of gathering and trunk lines representing an investment of $609,000,000. The investment also represents about 80 per cent of the total for crude lines.

Texas Oilmanac Data

Table 2—Natural-Gas Pipelines in Texas

(Source: Individual company reports to the Railroad Commission of Texas)
(In miles)

Pipeline company and address—	2 to 6-in.	7 to 12-in.	14 to 18 in.	20-in. and over	Total all sizes
Arkansas Louisiana Gas Co.: Shreveport	88.68	205.67	26.59	22.15	343.09
Border Pipe Line Co.: Houston	0	46.00	0	0	46.00
Bi-Stone Fuel Co.: Corsicana, Tex.	8.39	74.15	0	0	82.54
Brookover Gas Co.: Graham, Tex.	57.43	0	0	0	57.43
Brown, C. L.: Mexia, Tex.	47.00	0	0	0	47.00
Cities Service Gas Co.: Oklahoma City	44.10	137.20	26.50	108.40	316.20
Coleman Gas System: Coleman, Tex.	19.80	16.80	0	0	36.60
Colorado Interstate Gas Co.: Colorado Springs, Colo.	3.91	1.00	0	142.32	147.23
Community Public Service Co.: Fort Worth	15.48	12.27	0	0	27.75
El Paso Natural Gas Co.: El Paso	20.00	162.90	471.90	703.60	1,358.40
Empire Southern Gas System: Fort Worth	142.42	135.61	0	0	278.03
Extexas Producers Gas System: Tyler, Tex.	29.72	28.92	0	0	58.64
Frio Pipe Line Co.: Houston	4.31	47.61	0	0	51.92
Gas Pipeline Department of La Gloria Corp.: Corpus Christi, Tex.	0	29.08	0	0	29.08
Houston Pipe Line Co.: Houston	0	*250.00	*428.00	*67.00	*745.00
Industrial Gas Supply Corp.: Houston	60.53	104.05	182.40	0	346.98
Lavaca Pipe Line Co.: Houston	22.34	69.23	0	0	91.57
Live Oak Gas Co.: Three Rivers, Tex.	35.74	0	0	0	35.74
Mississippi River Fuel Corp.: St. Louis	37.74	18.67	20.06	0	76.47
Moran Utilities Co.: Houston	26.06	0	0	0	26.06
Natural Gas Distributing Corp.: Tyler, Tex.	33.00	0	0	0	33.00
Natural Gas Pipeline Co. of America: Amarillo, Tex.	0	0	4.40	135.05	139.45
Northern Natural Gas Co.: Omaha	63.24	60.29	67.08	241.11	431.72
Pan American Gas Co.: New York	22.30	32.84	69.29	0	124.43
Permian Basin Pipe Line Co.: Omaha	2.50	5.57	1.95	218.80	228.82
Phillips Natural Gas Co.: Bartlesville, Okla.	37.29	71.45	0	0	108.74
Pioneer Natural Gas Co.: Amarillo, Tex.	473.94	603.60	176.51	19.96	1,274.01
Producers Utilities Corp.: Dallas	39.50	0	0	0	39.50
Public Service Corp. of Texas: Fort Worth	57.39	110.38	0	0	167.77
Rio Grande Valley Gas Co.: Brownsville, Tex.	125.50	96.00	116.20	0	337.70
Southern Pipe Line Corp.: Houston	*16.00	*45.50	*20.50	3.00	85.00
Southern Union Gas Co.: Dallas	N.A.	N.A.	N.A.	N.A.	N.A.
Southwest Public Service Co.: Amarillo, Tex.	15.03	32.24	0	0	47.27
Southwest Natural Gas Co.: Lockhart, Tex.	94.52	135.49	0	0	230.01
Spearman Gas Co.: Mobeetie, Tex.	25.00	0	0	0	25.00
St. Charles Pipeline Co.: Houston	0	0	30.62	0	30.62

(Continued on next page)

TABLE 2—NATURAL-GAS PIPELINES IN TEXAS (Continued)

Pipeline company and address—	2 to 6-in.	7 to 12-in.	14 to 18 in.	20-in. and over	Total all sizes
Tennessee Gas Transmission Co.: Houston	497.30	343.60	330.30	1,161.12	2,332.32
Texas Eastern Transmission Carp.: Shreveport	0.90	95.30	198.70	460.20	755.10
Texas Gas Utilities Co.: Del Rio, Tex.	65.72	108.20	0	0	173.92
Texas Gas Corp.: Houston	0	123.00	23.00	0	146.00
Texas Southeastern Gas Co.: Bellville, Tex.	104.30	39.60	0	0	143.90
Texas Gas Transmission Corp.: Owensboro, Ky.	0	0	0	22.90	22.90
Texas Illinois Natural Gas Pipeline Co.: Houston	2.20	14.50	123.50	590.30	730.50
Trunkline Gas Co.: Houston	5.00	26.00	19.20	446.70	496.90
United Gas Pipe Line Co.: Shreveport	324.97	936.41	1,531.64	1,107.87	3,900.89
Wilcox Trend Gathering System, Inc.: Dallas	108.00	30.70	145.60	0	284.30
Subtotal	2,777.00	4,250.00	4,014.00	5,450.00	16,491.00
Lone Star Gas Co.:† Dallas					4,890
Transcontinental Gas Pipe Line Corp.:* Houston					875
Total‡					22,256

*Estimated mileage. †Mileage as of January 1, 1954. ‡Includes estimates.

Table 3—Crude-Oil-Pipeline Investment in Texas

(Source: Company reports to the Railroad Commission of Texas)

Pipeline company—	Gathering systems	Trunk systems— Stations and other property	Trunk systems— Pipelines	Total
American Liberty Pipe Line Co.	$473,844	$1,643,272	N.A.	$2,117,116
American Petroleum Co.	1,153,331	148,865	$588,183	1,890,379
Arkansas Pipe Line Corp.	267,974	N.A.	645,768	913,742
Atlantic Pipe Line Co.	2,707,751	11,129,729	22,458,857	36,296,337
Bell General Pipe Line Co.	549,168	355,457	N.A.	904,625
Cities Service Pipe Line Co.	1,482,347	3,226,795	5,661,864	10,371,006
Continental Pipe Line Co.	5,741,064	0	0	5,741,064
Cordele Pipe Line Co.	22,118	N.A.	41,063	63,181
Crown Central Pipe Line Co.	182,534	N.A.	448,636	631,170
Duval Pipe Line Co.	333,566	124,476	408,686	866,728
Gulf Refining Co., Southern Pipe Line Division	12,789,185	23,136,514	45,138,770	81,064,469
Humble Pipe Line Co.	22,621,697	47,125,060	76,010,822	145,757,579
Illinois Pipe Line Co. of Texas	1,073,418	0	0	1,073,418
Keystone Pipe Line Co.	0	6,417	259,054	265,471
Magnolia Pipe Line Co.	10,892,601	21,240,150	63,552,894	95,685,645
Mid-Valley Pipe Line Co.	0	1,953,889	N.A.	1,953,889
Nantucket Pipe Line Co.	0	269,642	1,579,625	1,849,267
Pan American Pipe Line Co.	7,280,671	4,860,558	13,050,264	25,191,493
Pasotex Pipe Line Co.	989,191	*12,673,216		13,662,407
Phillips Pipe Line Co.	7,463,332	4,498,686	12,645,001	24,607,019
Plains Pipe Line Co.	4,123,299	296,330	978,450	5,398,079
Pure Transportation Co.	498,636	5,526,836		6,025,472
Republic Pipe Line Co.	876,440	218,042	1,055,163	2,149,645
Service Pipe Line Co.	12,496,791	6,367,671	22,550,662	41,415,124
Shell Pipe Line Co.	9,311,606	11,219,539	38,036,186	58,567,331
Sinclair Pipe Line Co.	10,470,667	26,971,490		37,442,157
Sohio Pipe Line Co.	N.A.	*580,374		580,374
Southern Pipe Line Corp.	2,157,728	1,465,402	N.A.	3,623,130
Sun Pipe Line Co.	7,764,792	5,455,703	7,964,320	21,184,815
Texas-New Mexico Pipe Line Co.	6,369,550	6,515,228	17,358,062	30,242,840
The Texas Pipe Line Co.	7,245,343	16,758,784	37,434,065	61,438,192
Tidal Pipe Line Co.	972,178	*1,134,107		2,106,285
Wheeler Pipe Line Co.	3,431	39,459	19,978	62,868
West Texas Gulf Pipe Line Co.	0	11,538,566	30,819,645	42,358,211
Yount-Lee Pipe Line Corp.	432,542	0	0	432,542
Subtotal	$138,746,795	*$196,137,911	*$429,048,368	
Grand total				$763,933,074

*For those trunk systems reported as lump sum, a 60-40 per cent division was assumed between stations and pipelines.
N.A.—Not available.

Gas pipelines . . . Ten companies have about three-fourths of the gas pipeline mileage in Texas. Topping the list is Lone Star Gas Co. with almost 5,000 miles. The next nine are, again in order of total mileage: United Gas Pipe Line Co., Tennessee Gas Transmission Co., El Paso Natural Gas Co., Pioneer Natural Gas Co., Transcontinental Gas Pipe Line Corp., Texas Eastern Transmission Corp., Houston Pipe Line Co., Texas Illinois Natural Gas Pipeline Co., and Trunkline Gas Co. These 10 companies have over 17,350 miles of gas-transmission and gathering lines.

Investment figures were not available on gas pipelines. However, the big lines and high-horsepower stations indicate a total investment of somewhere near that of the crude-pipeline companies. Hence, the estimate of a billion dollars in total pipeline investment is on the conservative side.

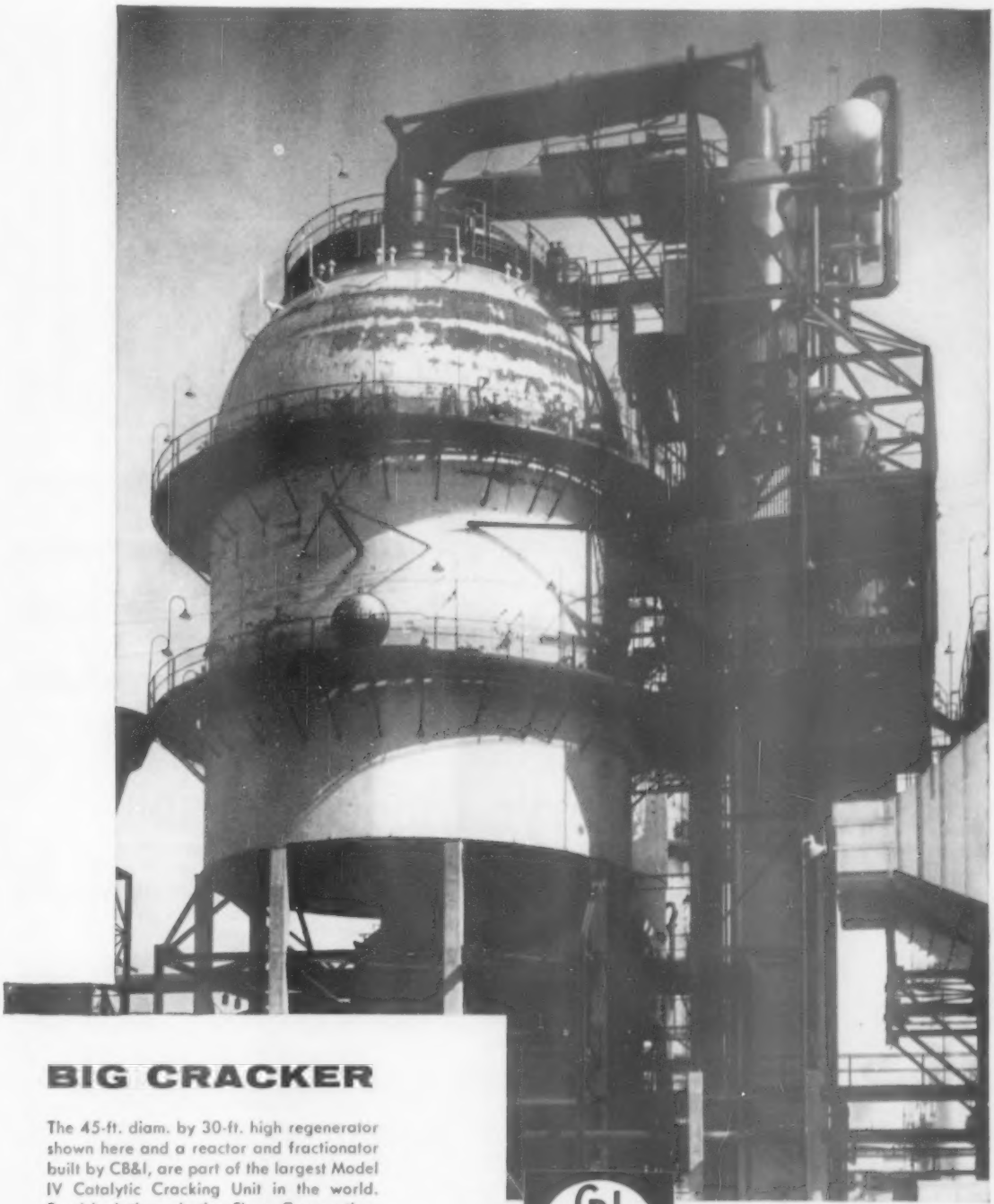
About the tables . . . Statistics for these tables were taken from individual company reports made to the Railroad Commission of Texas. We estimate that Table 1 covers over 98 per cent of the state's total crude mileage.

Some investment figures were not available for Table 3. These omissions are indicated in the table. No estimates were made. An assumption was made in the breakdown of investment in crude trunk systems, however. In some cases companies reported total trunk investment instead of giving separate figures for trunk line and stations. In this case, we assumed a breakdown of 60 per cent to trunk lines and 40 per cent to stations and terminals. Total investment was not changed by this assumption.

With the exception of feeder lines to gas-processing and recycling plants, the table on gas-pipeline mileage also covers about 98 per cent of the total. Some 30 small companies owning about 700 miles of line were omitted.

Data on investment and mileage for both crude and gas pipelines are up-to-date as of January 1, 1955, with but two exceptions. These are gas-pipeline companies which had not reported data to the Railroad Commission at the time of surveying. These are noted at the end of Table 2.

Data for these tables were gathered by James H. Murray, 209 May Building, Austin, Tex.



BIG CRACKER

The 45-ft. diam. by 30-ft. high regenerator shown here and a reactor and fractionator built by CB&I, are part of the largest Model IV Catalytic Cracking Unit in the world. Furnished through the Fluor Corporation, Ltd. for The Standard Oil Company of California's refinery at El Segundo, California, it has a design capacity of 40,000 B.P.D. The reactor was field stress relieved and X-rayed as was the lower 21 ft. 9 in. shell and bottom head of the fractionator which is clad with 12 per cent chrome.

When planning additions, or a new refinery, write Chicago Bridge & Iron Company for information on welded steel plate structures.

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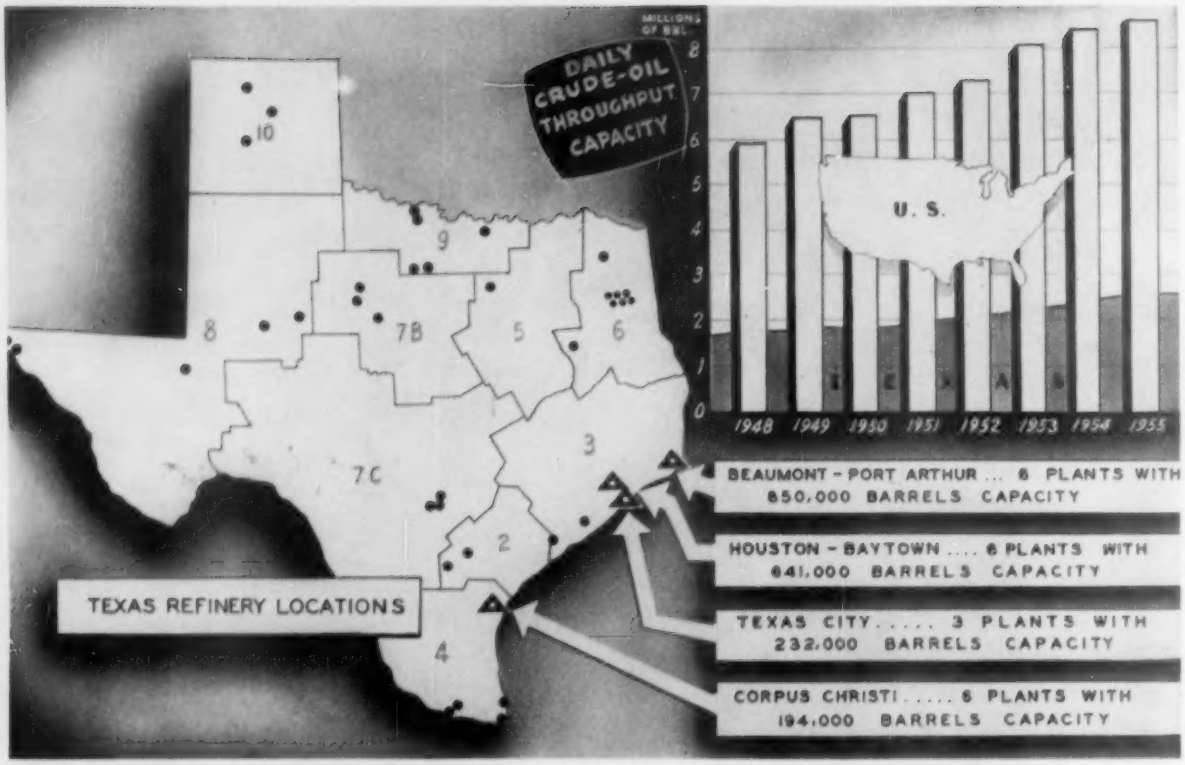


Texas' 58 refineries have 26.6 per cent of the nation's crude-charge capacity

Texas' Refining Story: Modernization

. . . and heaviest emphasis has been on cat reforming during past year

by F. Lawrence Resen
Gulf Coast District Editor

REFINING activity in Texas during the past 12 months was marked by internal expansions—with crude capacity remaining relatively unchanged at 2,312,050 bbl. daily, down about 20,000 bbl. from last year.

Modernization was the keynote and heaviest emphasis was on catalytic reforming: units completed, under construction or planned during the year totaled 218,900 bbl. per day. Catalytic cracking facilities are on the upswing and a trend to retire older crude units and replace with newer equipment continues to be in evidence. Aromatics are also in the spotlight with combination reforming and extraction units becoming relatively commonplace.

While several smaller plants turned toward catalytic reforming to stay abreast of the modernization parade, six added or are in the process of adding units, the heavy hand of obsolescence fell on six small refineries with

Did you know . . . ?

Seven of Texas' 58 refineries have a capacity in excess of 100,000 bbl. of crude per day . . . that 4 of these plants can process upwards of 200,000 bbl. each.

Excluding Texas, there are in the United States only 18 plants capable of charging more than 100,000 bbl. . . . and only 3 can charge more than 200,000.

Texas has 25 per cent of the nation's catalytic cracking capacity; 35 per cent of the alkylation capacity; and 31 per cent of the catalytic reforming capacity, exclusive of units now building.

Approximately 50,000 people are employed in the Texas refining industry.

TEXAS TODAY

a total of 58,080 bbl. of crude capacity. Of the six shut down, three were major-company plants, but in all cases the story was the same; cost of modernizing was not warranted by the market situation.

Gulf Oil Corp. . . . One of the most ambitious programs is that at Port Arthur, where Gulf is in the midst of expanding several refinery areas. Atmospheric distillation capacity will be increased by 82,500 bbl. per stream day. At the present time, 189,400 bbl. of capacity is available and the new facilities will bring the total to 271,900 bbl., Gulf's present crude-charge throughput. Older facilities will be taken out of service so that no net gain will be realized in plant throughput capacity.

Additional plans call for increasing fluid cracking capacity with the installation of a second 60,000-bbl. unit, and the adding of a 33,000-bbl. vacuum distillation unit. Meanwhile, a 30,000-bbl. Platformer was due on stream at the time this material was compiled.

Also at Port Arthur, The Texas Co. was involved in adding to its recently installed reforming capacity. A 20,000-bbl. Platformer was placed on stream last year and a second unit of 20,000 bbl. was completed this spring.

Magnolia Petroleum Co. . . . A long-range expansion program has been announced for Magnolia's Beaumont plant, where a new 19,000-bbl. Thermofor catalytic reformer was placed on stream. In 1956, a 30,000-bbl. Sovafining unit will be constructed, and in the following year a 35,200-bbl. vacuum unit and 35,800-bbl. Thermofor catalytic cracking unit will be added. In 1958, crude throughput capacity will be upped by 15,800 bbl. daily and an 11,000-bbl. Sovaformer will be built. Sovaformer capacity will be increased by an additional 6,700 bbl. in 1959.

Humble Oil & Refining Co. . . . At Baytown, Humble is in the midst of a revamping and expansion program, again on internal units. A fixed-bed Hydroformer is being converted to a 20,000-bbl. Ultraformer, and an additional 20,000 bbl. Ultraformer is being installed. Plans also call for the addition of a 4,850-bbl. Hydrofiner for handling lubes and a 12,000-bbl. Hydrofiner for processing heavy cracked naphtha. A catalytic polymerization unit was placed on stream in late 1954.

Eastern States Petroleum Co., Inc. . . . Two Unifiners were added at Eastern States' 50,000-bbl. plant in Houston. One with a 3,000-bbl. capacity and a second with a 7,000-bbl. capacity were placed on stream along with a 2,100-bbl. solvent-preparation unit. These are in addition to a Platforming-Udex unit Eastern States has.

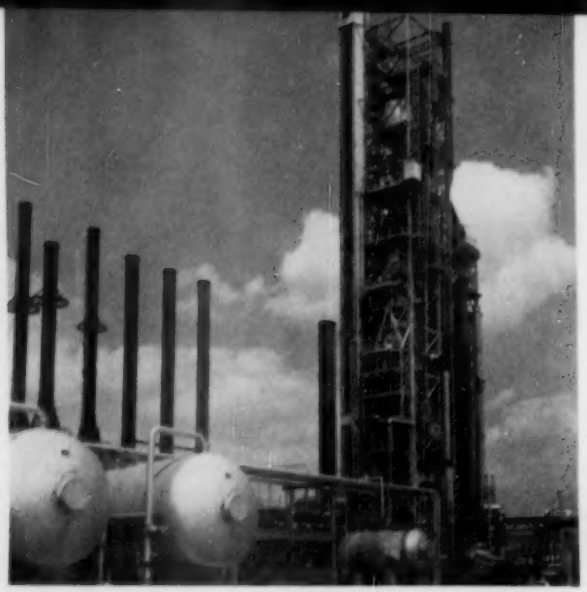
Sinclair Refining Co. . . . Also in the Houston area, Sinclair joined the reforming parade with its announcement of a 24,000-bbl. unit to be built according to its own design. The unit will use RD-150 platinum catalyst, a recent development of Sinclair Research Laboratories, Inc., and Baker & Co., Inc. M. W. Kellogg Co. has the engineering contract for this project. Sinclair has a 125,000-bbl. crude throughput capacity here.

The Texas Co. . . . In addition to the projects at its Port Arthur Works, Texaco completed modernization and expansion programs at its El Paso and Amarillo plants. The addition of a new combination crude-delayed coking unit was made at El Paso, where capacity was upped from 5,500 to 10,500 bbl. The combination unit can process 2,800 bbl. of heavy residuum daily. A 3,000-bbl. fluid unit was added along with new polymerization capacity now at 300 bbl. per day. Finally, a 3,300-bbl. Platformer-Unifiner was installed.

At Amarillo, throughput was also increased from 8,500 to 15,500 bbl. A 6,000-bbl. Orthoflow fluid catalytic cracker was added plus a 3,600-bbl. delayed coker. An alkylation unit with 500 bbl. capacity was installed and a poly unit of 480 bbl. added. This plant also includes a new Platformer-Unifiner with 4,800-bbl. capacity.

Shell Oil Co. . . . Late this spring, Shell announced a new 16,000-bbl. Platformer would be added to its Houston plant along with a new hydrodesulfurization unit of the same capacity. Shell already has a 15,000-bbl. Platformer and aromatics concentration unit at the refinery. The units are to be built by Pro-

GULF OIL CORP. embarked on a major revamping program at Port Arthur, where 82,500 bbl. of atmospheric distillation capacity will replace older units and a 60,000-bbl. fluid unit and a 30,000-bbl. vacuum distillation unit were announced.



MAGNOLIA PETROLEUM CO.'S Thermofor catalytic reforming unit went on stream this spring at Beaumont.

EASTERN STATES PETROLEUM CO., INC., added two Unifiner units and one solvent-preparation unit.

TEXAS TODAY

con, Inc., and will be completed in early 1956.

Phillips Petroleum Co. . . . Reforming came in for a big play in Phillips plants. A 7,000-bbl. reformer was completed at the Rice plant (fractionating plant at Borger), a 16,000-bbl. Platformer was completed at Sweeny, and a similar 16,000-bbl. unit is under construction at the Phillips refinery.

Pan American Refining Co. . . . In Texas City, a 21,000-bbl. Ultraformer has gone on stream. The latest addition to the six-building research center there was a new research lab opened in February. Research for the parent American Oil Co. is conducted there, including that for the refinery under construction in Virginia.

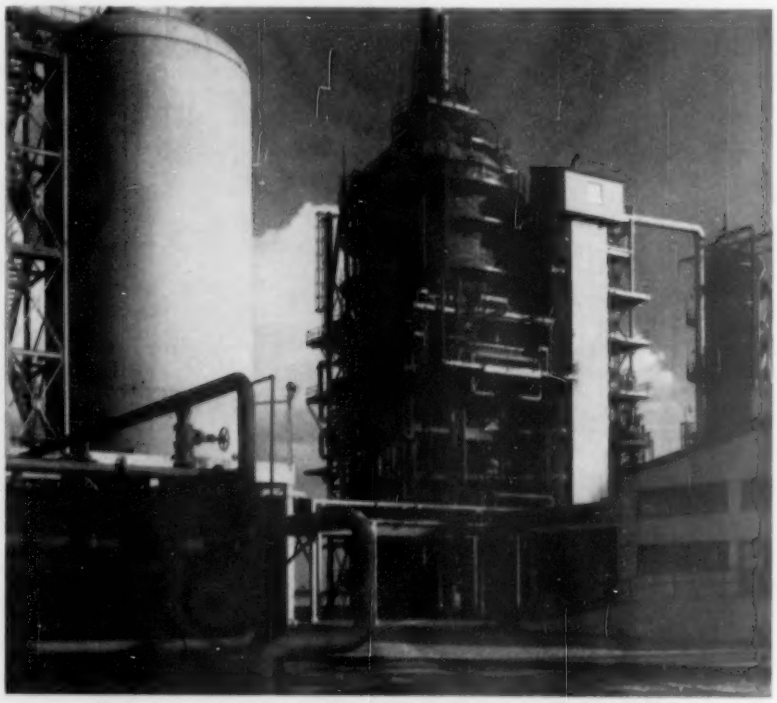
Among the independents, **McMurrey Refining Co.,** Tyler, added a decarbonizing unit at its 25,000-bbl. plant to improve product yields. The unit processes 8,000 bbl. of East Texas residuum and produces 7,200 bbl. of gas-oil. A new sulfuric alkylation unit is due to be completed by McMurrey.

Cosden Petroleum Corp., Big Spring, will increase most of its units in an over-all program which is partially completed. Crude capacity was raised 2,000 bbl. to 25,000 bbl. daily, vacuum unit capacity was increased 3,000 bbl., and additions are being made to increase fluid unit capacity by 3,000 bbl. An additional reformer of 3,200 bbl. is to be built to supplement the 4,500-bbl. Platformer now in service. A new U.O.P. hydrofluoric acid alkylation unit with a 2,064-bbl. capacity was also placed on stream this past year.

Crown Central Petroleum Corp. added a 5,000-bbl. Houdriformer at its 30,000-bbl. per day Houston plant; **Danaho Refining Co.,** Pettus, placed a 1,000-bbl. Platformer on stream; **Gladewater Refining Co.,** Gladewater, added to its facilities with a 700-bbl. Catformer; and **Col-Tex Refining Co.,** Colorado City, doubled its polymerization capacity to 160 bbl.

Shutdowns . . . Lack of equipment to produce the higher-quality products was the prime reason behind the rash of shutdowns in Texas. Cost of modernization which would have also duplicated equipment already in existence at other plants forced Gulf to close its 9,435-bbl. plant at Fort Worth and an 8,325-bbl. plant at Sweetwater. Similar reasons caused Magnolia Petroleum Co. to shut down its 13,320-bbl. Fort Worth plant.

Sid Richardson Refining Co., Texas City, closed its 18,000-bbl. refinery and pointed to the prevailing market situation as contributing to its decision. The plant was equipped with a 9,000-bbl.



SHELL OIL CO.'S catalytic cracking unit at the company's Houston plant.

THE TEXAS CO.'S No. 1 Platforming unit at the Port Arthur works is a 20,000-bbl. per day facility. A second unit of the same design capacity was completed this spring.

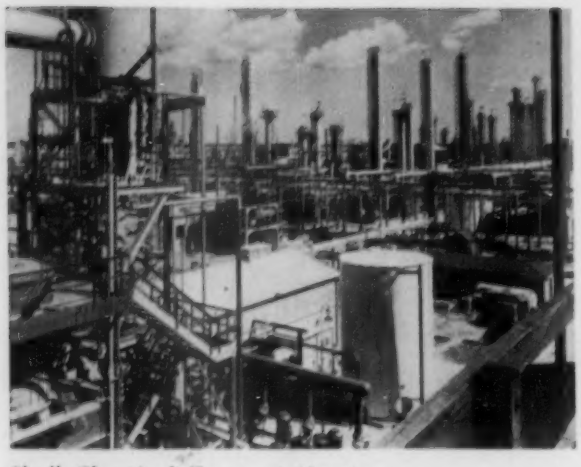
thermal cracking unit. **Premier Oil Refining Co.** closed its 5,000-bbl. plant at Arp and **R. Lacy, Inc.,** shut down its 4,000-bbl. refinery at Big Sandy.

Aromatics . . . A high proportion of the country's petroleum aromatics plants are located in Texas. Out of a total of 20 plants (2 are shut down and 2 are under construction), 8 are in the state. Although these plants might better be classified under petrochemicals, several refiners include them as integral parts of the refinery and they are being carried under the Refining section of this issue to avoid confusion.

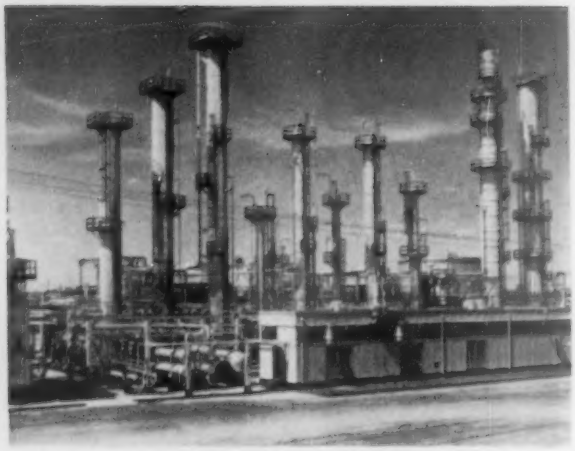
Para-xylene is being produced by two Texas plants, one at Baytown (Humble) and one at Big Spring (Phillips, with Cosden as operator). Benzene or toluene-xylene or both are being produced by Cosden, Eastern States Chemical Co., Houston, Pan American Refining Co., Texas City, Shell, Houston, and Great Southern Chemical Corp., Corpus Christi. Newcomer to the field will be Petrocarbon Chemicals, Inc., now building a Houdriformer at Irving to process purchased naphtha stocks.

Texas Refineries—Where They Are, and Their Capacities

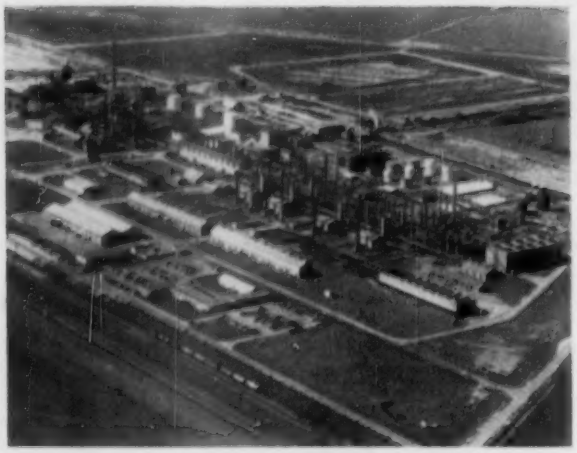
	Crude-oil charge cap., B/SD
American Liberty Oil Co.:	
Mount Pleasant	16,000
Atlantic Refining Co.:	
Port Arthur	61,000
Bryson Pipeline & Refining Co.:	
Bryson	2,000
Col-Tex Refining Co.:	
Colorado City	12,000
Continental Oil Co.:	
Wichita Falls	8,800
Corpus Christi Refining Co.:	
Corpus Christi	8,500
Palestine	3,500
Cosden Petroleum Corp.:	
Big Spring	25,000
Crown Central Petroleum Corp.:	
Houston	30,000
Dallawax Co.:	
Kilgore	500
Danaho Refining Co.:	
Pettus	4,500
Eastern States Petroleum Co., Inc.:	
Houston	50,000
Eddy Refining Co.:	
Houston	2,000
Flint Chemical Co.:	
San Antonio	300
G. & B. Oil Co.:	
Graham	700
Gladewater Refining Co.:	
Gladewater	2,500
Gulf Oil Corp.:	
Port Arthur	272,000
Humble Oil & Refining Co.:	
Baytown	309,000
Magnolia Petroleum Co.:	
Beaumont	200,000
Matagorda Corp.:	
Bay City	1,850
McBride Oil & Gas Corp.:	
Brownsville	7,500
La Blanca	3,500
McMurrey Refining Co.:	
Tyler	25,000
Monarch Refining Co.:	
San Antonio	2,500
Onyx Refining Co.:	
Hawley	7,000
Pan American Refining Corp.:	
Texas City	160,000
Panhandle Oil Corp.:	
Wichita Falls	8,000
Peerless Tank Cleaning Co.:	
Kilgore	1,000
Petroleum Products Refining & Producing Co.:	
Kilgore	1,500
Petrolite Corp., Ltd.:	
Kilgore	700
Phillips Petroleum Co.:	
Phillips	68,000
Sweeny	79,000
Phoenix Refining Co.:	
San Antonio	3,500
Pontiac Refining Corp.:	
Corpus Christi	30,000
Premier Oil Refining Co. of Texas:	
Baird	2,500
Fort Worth	7,500
Longview	4,200
Pure Oil Co.:	
Nederland	67,000
Rado Refining Co.:	
McAllen	2,000
Republic Oil Refining Co.:	
Texas City	42,000
Shamrock Oil & Gas Corp.:	
Sunray	12,000
Shell Oil Co.:	
Houston	125,000
Sinclair Refining Co.:	
Corpus Christi	28,000
Houston	125,000
Skelly Oil Co.:	
Longview	7,000
Southwestern Oil & Refining Co.:	
Corpus Christi	43,000
Standard Oil Co. of Texas:	
El Paso	30,000
Suntide Refining Co.:	
Corpus Christi	45,000
Delhi-Taylor Oil Co.:	
Corpus Christi	40,000
Delhi-Taylor Oil & Gas Co. and Mayfair Minerals, Inc.:	
Port Isabel	12,000
Texas City Refining, Inc.:	
Texas City	30,000
The Texas Co.:	
Amarillo	15,000
El Paso	10,000
Port Arthur	210,000
Port Neches	40,000
Three Rivers Refinery:	
Three Rivers	1,500
Tydal Co.:	
Gainesville	2,000
Wickett Refining Co.:	
Wickett	4,000
Total	2,312,050



Shell Chemical Corp. at Houston . . .



Cosden Petroleum Corp. at Big Spring . . .



Celanese Corp. of America at Bishop . . .

E. I. du Pont de Nemours & Co. at Orange . . .

Petrochemical Center, U. S. A. . . . That's Texas

by F. Lawrence Resen
Gulf Coast District Editor

TEXAS TODAY

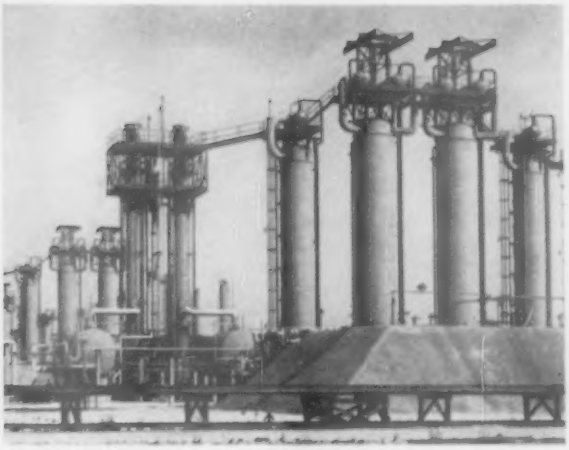
THE big news in petrochemicals during the past year was the return of synthetic-rubber plants to private industry and the surge of polyethylene from new facilities.

Fifty-five per cent of the butadiene capacity, 52½ per cent of the GR-S copolymer capacity, and 48 per cent of the butyl-rubber capacity in the Government's synthetic-rubber program is located in Texas. All of these switched to privately owned companies this spring.

In the booming polyethylene field, new facilities placed on stream in Texas in the past 12 months exceeded that which existed in the total United States 2 years ago. Out of a total of 371 million pounds of annual capacity, completed or under construction in the country during the year, 77 per cent, or 285 million, was in Texas. All except two 25-million-pound plants have been placed on stream, although not necessarily at full capacity. Totals for the United States, when these plants are completed, will stand at 571 million annual pounds; 395 million—69 per cent—located in Texas.

Phillips bombshell . . . However, announcement of a brand-new plant, which normally would brighten the picture, exploded on the polyethylene horizon and promised to cloud the immediate future.

Phillips Petroleum Co. said it planned to build a 145-million-pound per year ethylene plant at its Sweeny refinery and pipe the gas to the Phillips Chemical Co.'s Houston works, where another plant would be built to



Dow Chemical Co. at Freeport . . .

Texas Eastman Co. at Longview . . .

Celanese Corp. of America at Pampa . . .

Carbide & Carbon Chemicals Co. at Seadrift . . .

produce polyethylene. Two important factors made this a momentous announcement:

1. The Phillips process operates at less than 500 psi., a far cry from the 15,000-30,000-psi. pressure used in competing plants. Costwise, the equipment involved puts Phillips in an extremely favorable position.

2. Phillips has a new type polyethylene which promises to offset an important disadvantage of present types—it doesn't soften or deform up to 250° F. This means it can be sterilized without difficulty. It possesses a similar resistance to lowered temperature, not turning brittle as low as —175° F., and it is a tougher polymer. The combination could put Phillips atop the polyethylene industry.

Petrochemical centers . . . Meanwhile, attention continued to be focused on the main petrochemical centers in the state—the "Golden Triangle" of Beaumont - Orange - Port Arthur; and the Houston-Texas City area.

In the triangle area are located some 13 plants and refineries producing petrochemicals. Expansion was under way or completed at most of these: the Nitrogen Division plant of Allied Chemical & Dye Corp., Orange, added ethanolamines to its product list in addition to ethylene glycol and ethylene oxide; Spencer Chemical Co. came on stream with a 14-million-dollar polyethylene plant at Orange. Gulf Oil Corp. was completing a second ethylene plant at its Port Arthur refinery; this will have an 8,200,000-cu.-ft. per day capacity to add to 7-million cubic foot plant already operating. At nearby Port Neches, Jefferson Chemical added 50 per cent capacity to its ethanolamines output primarily by revisions to existing units. Koppers Co., meanwhile, indicated its interest in polyethylene by announcing a 25-million-pound plant to be added to its Port Arthur ethylbenzene works.

A new plant at Beaumont was placed on stream by E. I. du Pont de Nemours & Co., Inc. It produces methionine, an essential amino acid of nutritional value, as a feed supplement for poultry and other animals.

Activity in Texas City, meanwhile, included the mercaptan synthesis plant which Pan American Refining Corp. placed on stream. This material can be used for organic synthesis of methionine. Monsanto Chemical Co. started producing polyethylene in new facilities rated at 60 million pounds annually. Another big Texas City company—Carbide & Carbon Chemicals Co.—placed a new unit on stream which will use the Oxo process for the synthesis of 60 million pounds of chemicals yearly.

Up the Ship Channel, near Houston, Rohm & Haas Co. was completing a substantial expansion program for the production of acrylic chemicals. Most of a company-wide budget of 16 million dollars will be spent on completing the facilities which were half finished at the turn of the year. Shell Chemical Corp., meanwhile, increased its output of epoxy resins at its mam-

moth facilities at nearby Deer Park. Humble Oil & Refining Co. operated its paraxylene unit at 80 per cent of capacity, which doubled its previous output. Humble indicated a greater interest in the petrochemical field by making test batches of products for customer evaluation.

A new butadiene plant was announced for the Houston area by Texas Butadiene & Chemical Corp., which has Warren Petroleum Corp. as one of its backers. Warren recently completed a pentaerythritol plant about 40 miles north of Houston at Conroe.

In other parts of the state, one of the biggest projects was at Brownsville, where Hidalgo Chemical Co. (formerly Carthage Hydrocol, Inc., which was taken over by Stanolind Oil & Gas Co.) was revamping its plant. The plant is designed to process 90 million cubic feet of gas which will be converted to 6,000 bbl. of gasoline, 900 bbl. of diesel oil, 200 bbl. of fuel oil, and 300,000 lb. of chemicals daily. At Big Spring, Cosden Petroleum Corp. added two new products to its wide base—polybutenes are being produced by catalytic low-temperature polymerization of the lower olefins, and a resinous plasticizer is being made by the catalytic condensation of paraformaldehyde with heavy aromatics.

Phillips Chemical Co. facilities at Borger, consisting of a butadiene plant and a copolymer plant.

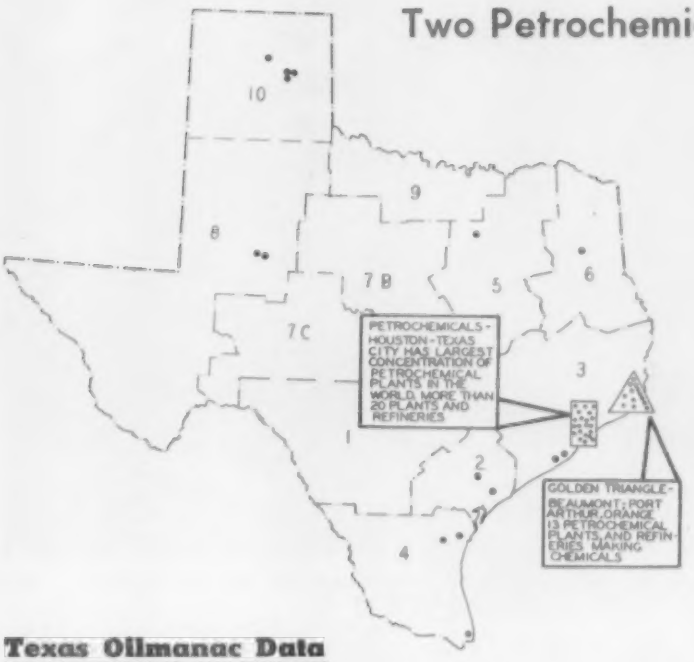
At Freeport, Dow Chemical is building a glycerol plant and a 25-million-pound per year polyethylene plant. Another polyethylene plant was placed on stream at Longview by Texas Eastman Co. with a rated annual capacity of 20 million pounds. Seadrift saw the startup of the massive new carbide installations. Ethylene oxide and butadiene are being produced here along with polyethylene. This latter installation has a 60-million-pound capacity.

Texas Oilmanac Data

Texas Petrochemical Plants . . .

Plant and location—	Principal products
Allied Chemical & Dye Corp., Nitrogen Division:	
Orange	Ethylene glycol, ethylene oxide, ethanolamines.
Atlantic Refining Co.:	
Port Arthur	Sulfonated detergents.
Carbide & Carbon Chemicals Co.:	
Texas City	Acetaldehyde, acetic acid, acetone, ethanol, methanol, ethylene glycol, ethylene oxide, vinyl acetate, vinyl chloride, polyethylene.
Seadrift	Ethylene oxide, polyethylene, butadiene.
Celanese Corp. of America:	
Bishop	Acetaldehyde, acetic acid, propylene oxide, propylene glycols, acetone, methanol formaldehydes.
Pampa	Acetone, acetic acid, acetic anhydride, vinyl acetate, acetates, propionic acid, etc.
Cosden Petroleum Corp.:	
Big Spring	BTX, mercaptans, paraxylene (operates for Phillips), polybutene, resinous plasticizer.
Diamond Alkali Co.:	
Houston	Perchloroethylene, vinyl chlorides, benzene hexachloride, DDT.
Dow Chemical Co.:	
Freeport	Ethylene and propylene oxides, ethylene, and propylene glycols, chlorinated hydrocarbons, styrene, vinyl chlorides, polyethylene,* glycerol.*
E. I. du Pont de Nemours & Co., Inc.:	
Orange	Methanol, polyethylene, adipic acid, hexamethylene-diamine.
La Porte	Methylamines, dimethyl formamide; carbamate fungicides.
Victoria	Adiponitrile (basic nylon salt).
Beaumont	Methionine.
Eastern States Chemical Corp.:	
Houston	Aromatic solvents.
Ethyl Corp.:	
Baton Rouge	Tetraethyl lead, ethyl chloride, ethylene dichloride, benzene hexachloride.
Houston	Tetraethyl lead, ethyl chloride, ethylene dichloride.
Ethyl-Dow Chemical Co., Inc.:	
Freeport	Ethylene dibromide.
Great Southern Chemical Corp.:	
Corpus Christi	Benzene, toluene, xylene, butylene concentrates.
Gulf Oil Corp.:	
Port Arthur	Ethylene, iso-octyl alcohol, butenes.
Hidalgo Chemical Co. (formerly Carthage Hydrocol, Inc., now owned by Stanolind Oil & Gas Co.)	Synthetic gasoline, chemicals; see Stanolind.
Humble Oil & Refining Co.:	
Baytown	Para-xylene, aromatic solvents, toluene.
Jefferson Chemical Co.:	
Port Neches	Ethylene oxide, ethylene glycols, mono-, di-, and triethanolamines, morpholine.
Koppers Co., Inc. (Chemical Division):	
Port Arthur	Ethylbenzene, polyethylene.*

Two Petrochemical "Centers" in Texas



TEXAS SYNTHETIC RUBBER PROGRAM PLANTS

Copolymer (GR-S) Plants

Goodrich-Gulf Chemicals, Inc.	Port Neches
Goodyear Synthetic Rubber Corp.	Houston
Phillips Chemical Co.	Borger
Texas-U. S. Chemical Co.	Port Neches

Butyl Rubber (GR-S) Plants

Humble Oil & Refining Co.	Baytown

Butadiene Plants

Humble Oil & Refining Co.	Baytown
Goodrich-Gulf, Texas-U. S. Chem.	Port Neches
Phillips Chemical Co.	Borger
Petro-Tex Chemical Corp.	Houston

Texas Oilmanac Data

Where They Are and What They Manufacture

Plant and location—	Principal products
Lubrizol Corp.: Houston	Petroleum sulfonates and other lube-oil additives.
Magnolia Petroleum Co.: Beaumont	Cresylic acid, sodium cresylate solutions.
Monsanto Chemical Co.: Texas City	Polyethylene, methanol, ethylbenzene, styrene, vinyl chloride, acrylonitrile, hydrogen cyanide.
Natural Gas Odorizing Co., Inc.: Houston	Ethyl and higher mercaptans.
Pan American Refining Corp.: Texas City	Mercaptans, hydrocarbon resins, benzene, toluene, xylenes, butenes.
Petrocarbon Chemicals, Inc.: Irving	Benzene, toluene, xylenes.
Phillips Chemical Co.: Houston	Polyethylene,* pyridines, ammonia, ammonium sulfate.
Etter	Anhydrous ammonia, ammonium nitrate.
Borger	Propylene, butylenes, propylene tetramer, mercaptans, pentanes, hexanes, octanes
Big Spring (Cosden Petroleum Corp., Operator)	Paraxylene.
Pure Oil Co.: Smiths Bluff	Polymer and condensation resins, solvents, nonparaffin concentrates, butenes.
Refinery Processors, Inc., and Oil Chemical Products, Inc.: Houston	Benzene, toluene, xylene, solvents, DDT base.
Rohm & Haas Co.: Houston	Acrylic monomers, acetone cyanohydrin.
Shell Chemical Corp.: Houston	Acetone, ethyl alcohol, epichlorohydrin, glycerin, ethyl chloride, epoxy resins, methyl ethyl ketone, ethers, alcohols, bisphenol-A, etc.
Spencer Chemical Co.: Orange	Polyethylene.
Stanolind Oil & Gas Co.: Brownsville (plant temporarily inoperative)	Acetaldehyde, acetic acid, acetone, ethanol, methanol, methyl ethyl ketone, propionaldehyde.
Texas Butadiene & Chemical Corp.: Houston	Butadiene.*
The Texas Co.: Port Arthur	Naphthenic acid, petroleum sulfonates, butenes.
Texas Eastman Co.: Longview	Polyethylene, ethanol, aldehydes, solvents.
Visco Products Co.: Sugarland	Crude-oil desalting and dehydrating compounds; special oxyalkylated compounds.
Warren Petroleum Corp.: Conroe	Pentaerythritol, methanol, acetaldehyde.

*Units planned or under construction.

SPRAWLING PEGASUS UNIT in Midland and Upton counties boasts both the world's deepest water flood (13,000 ft. in the Ellenburger) and a gas-injection pilot operation employing the highest injection pressure ever attempted.

Secondary Recovery Is Big Business in Texas

. . . and was biggest during the past 12 months

by Robert J. Enright
District Editor

TEXAS TODAY

TEXAS has had its biggest secondary-recovery year in history during the past 12 years.

Since May last year when the Journal conducted its most recent survey in the Texas issue, the Texas Railroad Commission has approved roughly 200 separate projects.

This might not have meant too much 15 or 20 years ago when most secondary-recovery operations concerned a few hundred acres at most, but times have changed. The majority of the projects activated last year, of course, still were relatively small. But there were some whoppers. And the past 12 months, like no other period in history, have emphasized unitization and secondary recovery in the big fellows.

Huge recoveries . . . Recovery figures from some of these giant projects are startling. Take these for instance. Since last summer secondary-recovery operations were launched via unit operation in Kelly-Snyder (SACROC Unit), Fullerton, Pegasus, Levelland, Goldsmith, and Sharon Ridge-Diamond "M" fields.

Together, these six operations take in roughly 140,750 acres of land and 3,340 wells.

If the operators' estimates are correct (and they generally are on the conservative side), these six projects alone will recover a tremendous 1,200,000,000 bbl. of oil which otherwise could not have been produced.

The above projects, all in West Texas,

TABLE 1—NUMBER AND TYPE OF PROJECTS APPROVED BY T.R.C. IN 1954

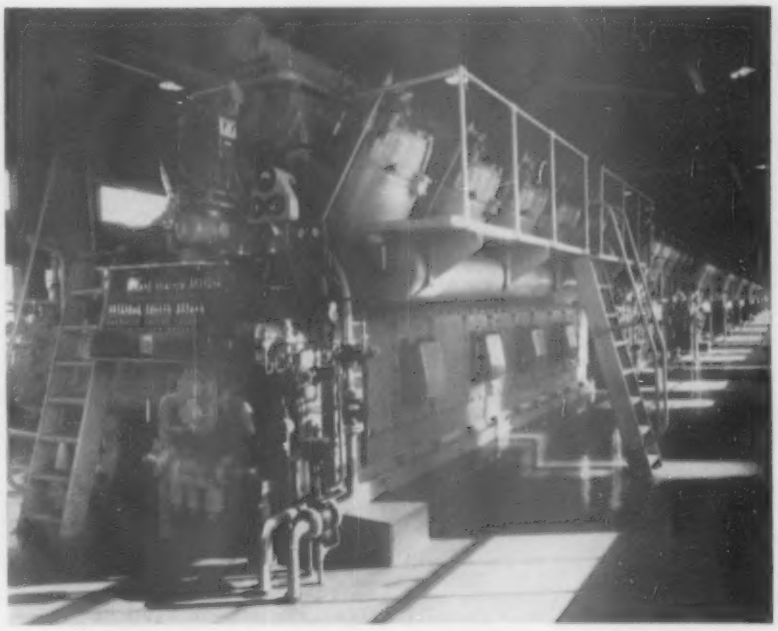
Area and district—	Water	Gas	Gas and water	L.P.G.	Total all projects
North Texas:					
Dist. 7-B	32	6	1	0	39
Dist. 9	44	8	1	0	53
East Texas:					
Dist. 5	5	0	0	0	5
Dist. 6	1	0	0	1	2
Gulf Coast:					
Dist. 2	1	4	0	0	5
Dist. 3	5	3	0	0	8
Southwest:					
Dist. 1	3	0	0	0	3
Dist. 4	5	10	4	0	19
Panhandle:					
Dist. 10	4	0	0	0	4
West Texas:					
Dist. 7-C	3	6	0	0	9
Dist. 8	24	8	1	0	33
Total	127	45	7	1	180

are joined by others large and small which are going into operation almost daily throughout the state.

What percentage of total oil now produced in Texas is secondary oil naturally is an elusive figure impossible to fix with much accuracy. Rough estimates from reliable sources, however, place it at about 400,000 bbl. a day or approximately 15 per cent.

This percentage inevitably will climb much higher in coming years as the above big operations and others like them begin to pay off, as big new fields become harder to find, as smaller projects increase in number, and as continuing research turns up new and improved methods of recovering a second or third oil crop.

Operators also have been far from lax in Texas in their efforts to get more of the oil that's there out by finding new secondary-recovery methods and improving engineering of projects employing those methods already in common use.



THESE BIG COMPRESSORS are a part of the Pegasus Unit natural-gasoline plant in Pegasus field. The plant is furnishing compressor capacity for the unit's high-pressure gas-injection pilot operation in the Pennsylvanian formation at 10,300 ft.

Other methods . . . It is felt, for instance, that high-pressure gas injection and water imbibition, both pioneered in Texas by Atlantic Refining Co. in Block 31 Devonian, Crane County, and the Driver area of Spraberry Trend area field, respectively, will enjoy wider popularity where these methods are applicable.

Atlantic already has expanded its Block 31 Devonian high-pressure gas-injection project three times to take in more acreage. The company estimates it will recover 52 per cent of the reservoir's oil in place via this method, as compared with an estimated 40 per cent which it would recover with a conventional water flood. And 12 per cent more oil is enough to raise a lot of eyebrows.

Some of these lifted brows apparently belonged to Magnolia Petroleum Co. and other operators in Pegasus field—one of the big fellows mentioned earlier.

Magnolia, as unit operator, last fall launched a high-pressure pilot operation into the 10,300-ft. Pennsylvanian formation through a lone input well in the southwest portion of the field. Gas will be compressed into the Pennsylvanian at about 4,500 to 4,600 psi.—about 500 to 600 psi. higher than input pressure at Block 31 and so far as is known the highest injection pressure attempted to date.

Magnolia will compare results from this pilot with those obtained from a pilot five-spot water flood started in the approximate center of the field. Data gleaned from these tests should help in establishing the relative merits of the two methods.

L.P.G. flood . . . Another new method of increasing recovery—injection of L.P.G. (butane and propane)—also made headway last year. Four such operations were launched in the state since last fall. These projects should throw considerable light on economic feasibility of the method.

It is conceded almost everywhere that injection of L.P.G. should hike production and ultimate recovery considerably more than any injection fluid now used. The unknown is whether the process could increase recovery sufficiently to counteract the higher cost of the injection fluid and thus make the method practical.

L.P.G. injection as a means of increasing recovery was pioneered unwittingly by Shamrock Oil & Gas Corp. on its Brumley lease in West Panhandle field of the Texas Panhandle. Shamrock began storing butane and propane in a nearly depleted limestone oil pay at 3,440-50 ft. The products came from the company-operated Moore County gasoline plant near by.

Production from three small wells on the lease shortly afterward began to soar spectacularly 3 months later. High production continued for about 1 year before tailing off, and Shamrock engineers believe that portions of the reservoir were completely flushed.

The company was sufficiently impressed by all this to start a similar injection project this year on another lease about 7 miles away.

Three other such projects are either already in operation or soon will be. Frank Buttram, Oklahoma City independent, started one last fall in Camp Hill field of Anderson County.

Petrocel Corp. is going forward with a unitization and L.P.G.-injection program in 457-acre Killam field in Webb County in far South Texas. This one, like the Shamrock project, will function in conjunction with a storage operation.

Phillips interested . . . Phillips Petroleum Co. became the first big company to publicly exhibit interest in the method as recently as mid-April when it asked the Texas Railroad Commission for a permit to start a project on its 320-acre Greathouse "D" lease in the Pembrook area of the huge Spraberry Trend area field.

A company engineer testified that Phillips thinks the method will have "highly satisfactory" results and that it can recover 90 per cent of the oil in place in the area flooded by the butane.

Some of these research efforts and others coming along in the future will prove out and some won't. Those that do, even if the secondary-recovery increase is 1 per cent or less, will mean that millions and millions of additional barrels of Texas oil can be produced.

When you talk now about Texas oil which cannot be produced by any known method, you're talking about billions of barrels and billions of dollars.

William J. Murray, Jr., chairman of the Texas Railroad Commission, said recently that roughly 20 billion barrels of Texas oil can be produced by primary methods and another 10 billion

SETTLING TANKS AND FILTERS process water which boosted monthly production from Atlantic Refining Co.'s W. D. Johnson lease in South Ward field, Ward County, Texas, from 300 bbl. to a high of 151,000 bbl. Production still averages more than 40,000 bbl. a month. (Photo by Austin J. Six, Atlantic Refining Co.).

TEXAS TODAY

barrels with present secondary-recovery methods.

Between 45 and 50 billion barrels, he said, cannot be produced until research comes through with new techniques. That's a lot of oil.

Texas Secondary-Recovery Progress

While intensive research continues on new methods, Texas operators are pressing the best currently known methods into service at an ever-increasing tempo.

It's impossible to say exactly how many secondary-recovery projects are operating in the state or probably even to come very close. The Texas Railroad Commission keeps records on the operations it approves, but some of these are abandoned, some never started, and others operate without commission knowledge.

The Journal estimated a year ago that there were roughly 500 active operations in the state (not including cycling operations into gas reservoirs).

This was based primarily on Texas Railroad Commission surveys. The commission in its first such study covered operations up to the first of 1952. It listed 254 active secondary-recovery projects in the state. For well over a year now the commission has worked to update this survey to the first of 1954. The study has been completed but not yet published.

Preliminary figures a year ago listed 613 projects either in operation or for which applications to begin operation had been approved by the commission.

In succeeding months, the commission established that 28 of the projects in operation as of January 1, 1952, had subsequently been abandoned, dropping that number to 226.

It determined that 181 projects of the 359 approved since the first of 1952 were active at the first of 1954, giving a total recorded active list of 407. The commission did not get reports, however, from 20 per cent of the operators contacted, so that the 407 figure is believed to be a good deal too low.

Complete returns probably would have resulted in a final figure of somewhere between 450 and 500 active projects as of January 1, 1954.

Activation of projects, of course, lags considerably behind approval in many cases. Probably a majority of the operations approved during the last half of 1953 were not yet installed by the first of 1954.

The figures from the latest commission survey are revealing in that they show that the number of active secondary recovery projects in the state at least doubled in the 2 years to January 1, 1954. They are especially significant when you consider that the first gas-injection project in the state was started in 1926 and the first water flood in 1935—both in North Texas.

What happened last year . . . This surge to secondary recovery isn't slacking off. The Railroad Commission from the first of 1954 to the first of this year approved applications for 180 new projects and operators are bettering this rate so far this year.

Water floods were still far and away the most popular secondary-recovery instrument—making up 123, or nearly 70 per cent, of the total projects approved. (See accompanying Table 1.) In addition, the commission gave the green light to 49 gas-injection operations, 7 combination gas and water-injection projects, and 1 L.P.G.-injection operation (the other three L.P.G. projects referred to earlier were approved this year).

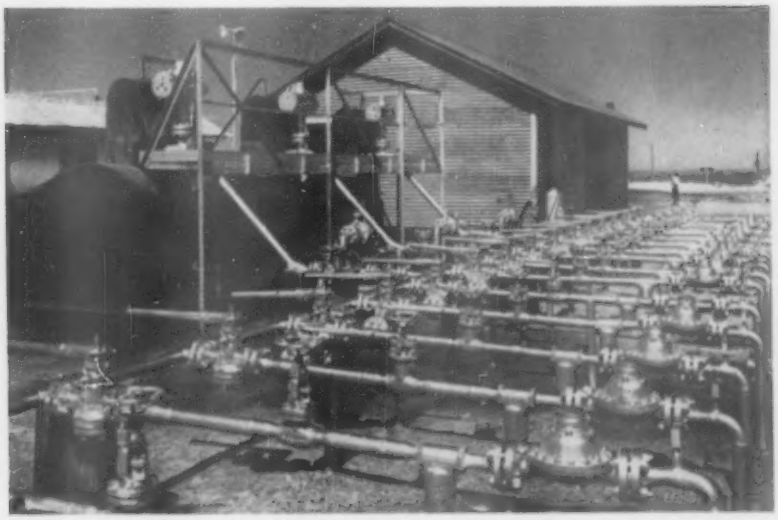
North Texas . . . North Texas, comprising Railroad Commission Districts 7-B and 9, showed the way last year as it has nearly every year with 92 projects approved—more than half of the total 180.

Broken down by districts, District 9 was the winner with 53 operations—44 of them water floods, 8 gas-injection operations, and 1 combination gas and water. By counties, Wichita County led the pack with 15 projects (all but one water floods), followed closely by Archer and Young counties with 11 and 10 projects, respectively.

District 7-B ranked second among the districts with 39 operations. Of these, 32 were water floods, 6 gas, and 1 gas and water.

Jones County counted the most projects with nine, followed closely by Shackelford County with eight. In both counties, all but one of the projects were water floods and in each case this single was a gas-injection operation.

When you think of water flooding in Texas, it's natural to think of North



WATER GOES TO ACCUMULATOR on W. D. Johnson lease after leaving filters where it is stored against injection and is available for back-flushing filters. From accumulator, water enters injection lines to Yates sand wells in South Ward. This field is one of the largest and most profitable water flooding areas in Texas. (Photo by Austin J. Six, Atlantic Refining Co.)

Texas. The area is well adapted for it. Producing formations there are mostly shallow. Development costs are comparatively low. A large percentage of the wells are strippers, and the reservoirs are primarily of the solution-gas type.

Most water-flood production is in Cisco sands of Pennsylvanian age. These include the Gunsite and Thomas sands in Archer, Baylor, Jack, Young, Wilbarger, and southern Wichita counties; the Thornberry, Burk, and others in northern Clay and Wichita counties; and the Cook, Cross Cut, Tannehill, and Bluff Creek sands in the Abilene district. The Cisco group outcrops in Young and Stevens counties.

These shallow fields usually are located on plunging noses and small irregular domes along the Bend arch and the Red River uplift. The oil accumulations on crests and flanks result from structural or stratigraphic trapping.

The producing sands are much more permeable and porous than in Pennsylvania and in many cases more so than in the Mid-Continent. Projects are active in pays ranging from fine shaly sand to clean coarse-grained sand with high permeability. Pays seldom are more than 20 ft. thick.

Productive area of the secondary-recovery operations in this region is small—generally falling between 20 to 500 acres. Depth ranges from the shallow Permian, Stine, and Tannehill sands at 250-300 ft. at the shallowest points to the Bend series at about 6,100 ft. Few are below 2,000 ft.

Projects were approved in 1954 in 12 of District 7-B's 24 counties and in 10 of District 9's 15 counties. In District 7-B, these were: Taylor, Throckmorton, Brown, Callahan, Coleman, Eastland, Fisher, Haskell, Jones, Shackelford, Stephens, and Stonewall counties. In District 9, they were: Archer, Clay, Cooke, Denton, Jack, Knox, Montague, Wichita, Wilbarger, and Young counties.

Some of the most spectacular results of secondary-recovery efforts have occurred in North Texas. Some of these projects have produced far more secondary oil than primary.

One such operation is Magnolia Petroleum Co.'s in the West Burkburnett area of Wichita County just south of the Oklahoma line. The company has enjoyed phenomenal success in water flooding in this area since 1944 and has steadily expanded its operations there. The newest and one of the largest Magnolia ventures in North Texas is in Northwest Burkburnett Extension field which is just now beginning to pay off big. This one takes in 2,800 proved acres and a total of about 284 producing and injection wells—a pretty big operation for the North Texas area.

East Texas . . . In this area too, comprising Districts 5 and 6, water flooding is practically synonymous with secondary recovery, due primarily to the fact that most reservoirs have a natural water drive.

In 1954 there were five water floods approved in District 5, one water flood and Buttram's L.P.G. operation started in District 6.

All District 5 projects were in Corsicana Shallow field in Navarro County. This field is the oldest oil pool in Texas. As the name indicates, it's shallow—about 1,027 ft. to the Corsicana sand.

It has been the most active water-flooding area in East Texas for several years. Seven projects were initiated in the field in the 2 years 1952 and 1953.

In District 6, the lone water flood last year was approved for Rodessa field of Marion County.

Meanwhile in East Texas, the granddaddy of all secondary-recovery operations, East Texas field, keeps rollin' along.

This huge field sprawls over Upshur, Gregg, Rush, Cherokee, and Smith counties. It originally took in about 135,000 acres, but water encroaching from the west has trimmed this figure to below 100,000 acres currently.

Operators in the field, in cooperation with the state, started a comprehensive water-injection and production program back in 1938. It is believed that this program will increase total oil recovery from the field by about 600,000,000 bbl.

The East Texas Salt Water Disposal Co. was organized in 1942 to carry out injection on a field-wide basis for all operators. All produced salt water is cycled back into the reservoir. By the first of this year, East Texas Salt Water Disposal had injected almost 1.34 billion barrels of salt water in the producing Woodbine sand topped at 3,600 ft.

Bottom-hole pressure of the field during the 12 years since the company was organized has increased 11.15 to 103.86 psi. as of January 1, 1955. As of April 1 this year, it was 1027.24 psi. Though the number of wells in the huge pool is falling off daily, there still are almost 20,500 of them.

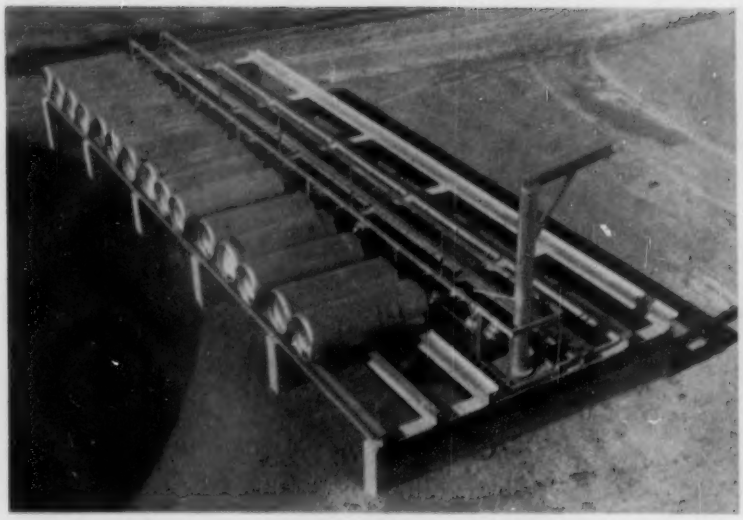
The pressure-maintenance project not only is paying its way but has already (as of January 1) returned $1,500,000 of the original capital paid in to launch it. It expects to pay back easily the remaining $500,000.

At the same time, East Texas Salt Water Disposal pays 50 per cent or more of the net profit from the operation as taxes to the Government.

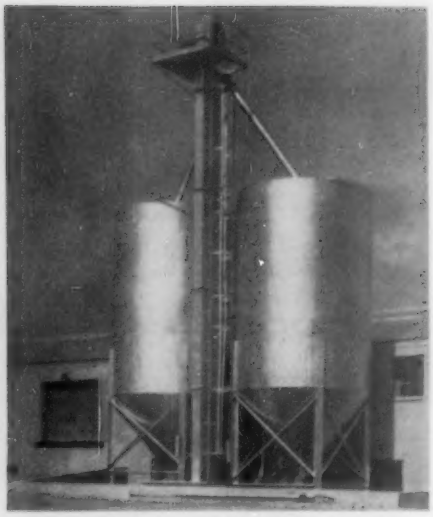
Texas Gulf Coast . . . In Districts 2 and 3, comprising the Gulf Coast area, the commission approved a total of 13 projects, seven of them gas injection, six water floods.

Four gas and one water were given permits in District 2. These were in Live Oak, DeWitt, and Calhoun counties. The thre gas-injection operations and five water floods approved in District 3 were slated for Chambers, Hardin, and Liberty counties.

As in East Texas, many of the reservoirs, especially the best ones, have a natural water drive. One of the best-known secondary-recovery operations is in the Armstrong and Chenault reservoirs of Old Ocean field in Brazoria and Matagorda counties.



CHLORINE FOR WATER TREATING at SACROC's West Texas water flood is taken from cylinders at this installation.



STORAGE BINS for handling chemicals at SACROC flood.

TEXAS TODAY

It is estimated that residue gas reinjected into these two formations will hike oil recovery by 50,000,000 bbl. and the condensate take from the field by 20,000,000 to 24,000,000. bbl.

Injection is into the gas caps. The Armstrong, at 9,700 ft., takes in about 14,500 productive acres. The Chenault at 9,400 ft. comprises 9,537 acres.

Southwest Texas . . . This area, including Districts 1 and 4, continued active in 1954. All told, there were 22 secondary-recovery projects approved—all but three of them in District 4.

The 19 operations in District 4 included 10 gas-injection projects, 5 water floods, and 4 combination gas and water operations. Duval County had the most with five projects. Other counties represented were Starr, Zapata, Webb, and Jim Wells.

The three projects in District 1 were water floods, with Frio County most popular.

The majority of the projects in the Southwest Texas region are in Eocene sand pays ranging in depth from 1,250 to 3,850 ft.

New projects were approved last year in Big Foot, Garcia, Piedre Lumbre, Billings, West Jennings, Quien Sabe, North Government Wells, Loma Novia, Cam, Gruy, O'Hern, and Hollow Tree fields, among others.

Texas Panhandle . . . Production in the Panhandle is chiefly from limestone and dolomite reservoirs. These were not considered likely secondary-recovery prospects until relatively recently. Consequently secondary-recovery received very little attention in the area until about 8 or 10 years ago.

One of the earliest operations here was in the West Pampa area of Panhandle field. This one was conducted in the 3,100-ft. Brown dolomite by the West Pampa Repressuring Association. It took in about 1,000 wells on 11,800 productive acres on the north flank of the long extensive anticlinal feature which makes up Panhandle field.

Additional oil recovered by this project is believed to be around 15,000,000 bbl. already, and the increase in gas and gas-liquids production due the program has more than paid for its cost. Success of this project has led to similar operations in the Panhandle dolomite reservoir.

Last year, four more gas-injection projects were approved in the Panhandle region (District 10)—all of them in Panhandle field.

West Texas . . . Texas operators have shown great interest in recent years in secondary-recovery operations in Permian dolomites and sands ranging downward from about 2,400 ft. in West Texas (Districts 7-C and 8).

Most of these have been water floods, although a considerable number of gas-injection projects are being initiated in the limestone reservoirs.

Last year the Railroad Commission approved 42 projects for the two districts—the lion's share, 33, in District 8.

The District 8 operations included 24 water floods, 8 gas-injection projects, and 1 combination water and gas-injection project. These were 13 counties including Howard, Glasscock, Pecos, Ward, Winkler, Mitchell, Borden, Levelland, Hockley, Andrews, Ector, Loving, and Dawson. Ten of the total 33 were concentrated in Ward County—mostly in South Ward and North Ward-Estes fields.

In District 7-C, the commission approved six gas-injection operations and three water floods in five counties: Crockett, Upton, Coke, and Runnels. Runnels had four of them.

District 8 warrants special mention. All six of the huge secondary-recovery projects mentioned at the start of this article (all of them pressure-maintenance operations) are concentrated there. There is a partial exception; Pegasus field laps over into District 7-C.

These six will produce roughly 1.2 billion barrels of secondary oil among them. The big three—SACROC, Pegasus, and Sharon Ridge-Diamond "M"—will account for more than a billion barrels of the total.

Scurry County also merits attention. Two of the big ones, SACROC and Sharon Ridge-Diamond "M," are here. Sandwiched in between is another big operation, Diamond "M" unit operated by Lion Oil Co. These three together also will account for a billion barrels or so of secondary oil.

SACROC . . . No matter how you group your statistics, the mammoth SACROC project in Kelly-Snyder field comprises the bulk of your figure.

This is the biggest field ever unitized for pressure maintenance and secondary-recovery — taking in 50,000 acres and 1,236 wells producing from and injecting into the Canyon Reef.

Primary recovery is estimated 667,-

INJECTION STATION for SACROC water flood. System has 53 injection wells and distributes some 200,000 bbl. per day of water to producing formations.

000,000 bbl.—secondary-recovery even higher at 795,000,000 bbl.

The big program, kicked off late last year, involves water injection on a line down the crest of the formation, and gas injection at the north end of the field. There are 53 water-injection wells.

So far, the gas portion of the project hasn't been started. Water, however, is going into the Canyon Reef formation at a tremendous rate, with more than 25,000,000 bbl. of water injected as of April 1 this year.

Properties formerly held by W. A. Moncrief and associates on the east flank of the field which stalled the huge program for many months were incorporated into the unit last October. These properties, consisting of 42 plus wells, were purchased by Ponies Oil Co. of Dallas.

The SACROC Unit is split into three segments, with three different operators and three identical high-pressure water-injection stations. The north segment is operated by Standard Oil Co. of Texas, the middle segment by Magnolia Petroleum Co., and the south segment by Sun Oil Co.

Sharon Ridge Canyon Unit . . . Separated from the SACROC operation by the Diamond "M" Unit to its north is the new Sharon Ridge Canyon Unit.

This one takes in 337 oil wells on almost 13,500 producing acres in Sharon Ridge-Diamond "M" field of Scurry and Borden counties. Pay is the Canyon lime.

Here a peripheral water flood with two concentric rings of input wells is expected to recover an estimated 109,000,000 bbl. of additional oil at a cost of about $21,000,000.

There are 31 input wells within the unit area, and others will be operated across the line in Diamond "M" field to isolate this flood from one under way in Diamond "M."

Here again, secondary oil will surpass that produced by primary methods which is estimated at 95,000,000 bbl.

Plans are to inject 30,000 bbl. of water daily. The unit, as will the SACROC Unit, will get its water from the new Lake J. B. Thomas under contracts with the Colorado Municipal Water District.

Pegasus Unit . . . This big unit, taking in 17,850 acres in Pegasus field of Midland and Upton counties, started gas injection into the 10,300-ft. Pennsylvanian formation late last year.

The operation actually is in the pilot stage currently but a full-scale pressure-maintenance program definitely will be undertaken.

Magnolia, the operator, will conduct three different pilots in the field simultaneously. These are the high-pressure gas-injection operation in the Pennsylvanian formation at 10,300 ft. in the southwest part of the field, a Pennsylvanian water flood in the central portion, and an Ellenburger flood on the extreme eastern side.

The latter pilot has a claim to fame as the deepest water flood ever attempted (13,000 ft.).

Magnolia spokesman said whichever pilot proves best in the Pennsylvanian will be extended throughout that reservoir. Because of this, recovery estimates are necessarily rough. One figure used places total secondary oil from both reservoirs at about 200,000,000 bbl.

These pressure-maintenance operations will be going in quite early in the life of the field. Neither reservoir has been completely developed, though they are reasonably well defined. Magnolia estimates that there will eventually be roughly 365 producers if proved acreage is completely drilled on the present 80-acre spacing pattern now in use.

These are the three big fellows. The other three—the Goldsmith San Andres Unit of Ector County, operated by Gulf Oil Corp.; the Fullerton Unit operated by Fullerton Oil Co. in Andrews County; and the Levelland Unit operated by Stanolind Oil & Gas Co., in Hockley County—are estimated to recover another 100,000,000-plus barrels of extra oil.

These three units take in 18,400, 25,000, and 16,000 proved acres, respectively.

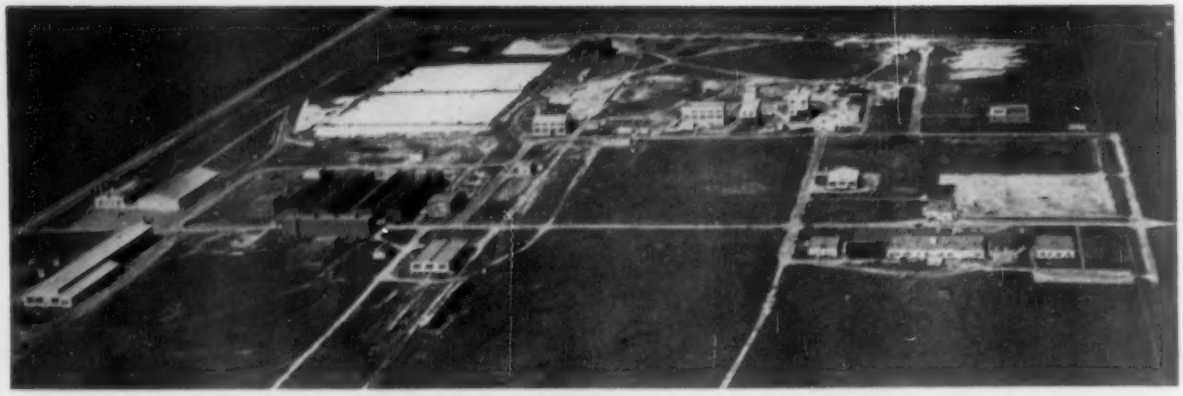
The Goldsmith project is injecting 6,000 bbl. of water daily into the 4,200-ft. San Andres dolomite through 31 input wells ringing the south dome of Goldsmith. It also involves injection of 9,500,000 cu. ft. of residue gas daily into the field's broad gas cap.

In Fullerton field, the operators expect to recover an additional 32,400,000 bbl. of oil by injecting gas into the field's Clearfork producing horizon.

The Levelland project also will enploy gas injection through about 18 inputs. The pay horizon here is the San Andres at 4,470 ft. There are 378 producing oil wells in the field. The input wells will be situated to provide reasonable dispersion of gas throughout the reservoir. Cost of this program is estimated at $11,000,000.

These are just a few of the many secondary-recovery operations in West Texas and over the rest of the state. More of them are launched all the time. You don't look at figures of this kind very long before you reach the obvious conclusion that secondary recovery in Texas is big business.

Note: Secondary-recovery operations in this article, for the purpose of brevity, include both secondary-recovery and pressure-maintenance operations as defined by the American Petroleum Institute.

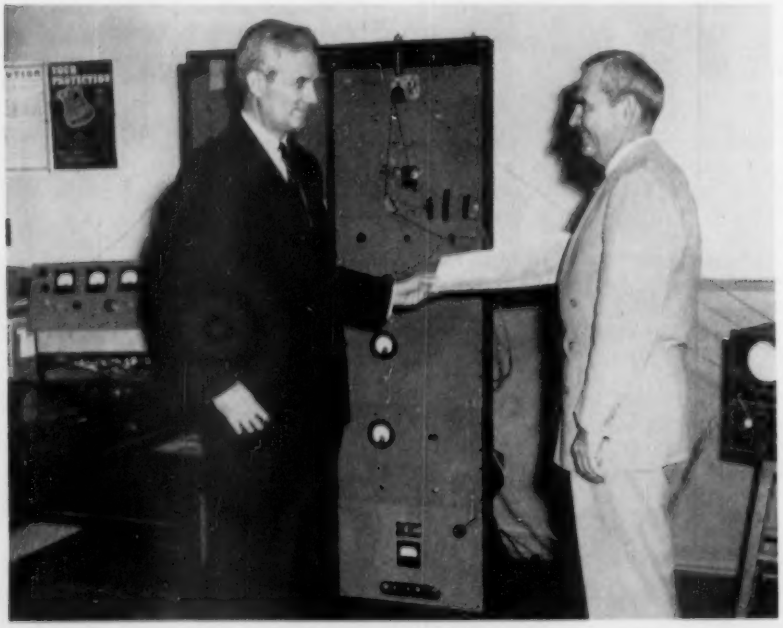


FROM THE AIR can be seen the 21 research laboratories of Texas University's Balcones Research Center. Of these six are engaged in research of direct benefit to the petroleum industry.

Balcones Research Center Helps Find the Answers

TEXAS TODAY

Laboratories provide research tools ranging from samples from thousands of oil and gas wells to a correlation computer or electronic brain.



RESEARCH PROGRESS is being discussed here by Dr. Wilson Logan, Texas University president, and Dr. A. W. Stratton, director of the lab. In background is the correlation computer.

AN expanding program of research of direct benefit to the petroleum industry is under way at the Balcones Research Center of University of Texas at Austin.

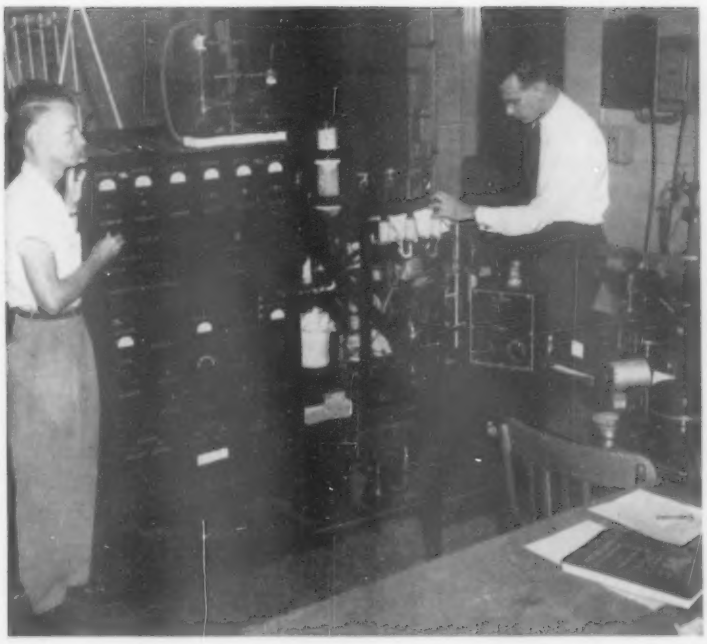
The research center is located 9 miles northwest of Austin. During World War II it was a government magnesium plant. The university has acquired it to facilitate its increasing research activities. Twenty-six of the former plant's 34 buildings now house 21 laboratories. Six of these are devoted to oil-industry research.

These laboratories provide many research tools for oil men, ranging from tangible samples from thousands of oil and gas wells to radio waves and the bombardment of molecules in electronic instruments.

Each of the six laboratories is an integral part of some university department or bureau. Three of them—the well-sample and core library, the U.S. Geological Survey laboratory and the mineral technology laboratory—are under the executive supervision of Dr. John T. Lonsdale, head of the university's bureau of economic geology.

Activities of the six laboratories include:

1. The well-sample and core library of the bureau of economic geology is one of the largest public collections of its kind in the United States. It contains over 4 million individual samples representing 55,000 oil, gas, and water wells in every section of Texas. The collection weighs 300 tons and, in length of geologic sections represented, measures approximately 15,000 miles. The library also has a substantial collection of oil-well cores. From 150 to 200 oil-company geologists make use of the collection in their investigations annually. The well samples are conveniently filed, material is easly located, and visiting geologists and students have the privilege of subjecting the samples to any process of analysis desired.



MASS SPECTROMETER is used to make qualitative and quantitative analyses of gases.

WELL-SAMPLE LABORATORY contains over 4,000,000 well samples for 55,000 wells.

2. The USGS laboratory is making a basic geologic study of the oil-rich Pennsylvanian age reefs of North and West Central Texas. The recent discovery of oil in buried fossil reefs in Scurry County caused oil companies and educational institutions alike to call for such an investigation. Previously, oil production from reef fields had been limited and therefore little was known about the occurrence of these large limestone reservoirs. Now the Texas discoveries and the discovery of oil in fields of the same type in western Canada have stimulated scientific studies of reefs everywhere.

A tremendous amount of material is available for study. Recently the laboratory obtained 12 tons of cores from the Texas reef fields, and these are being subjected to basic analysis in an attempt to determine the environment under which the reefs were formed.

This may provide a key to the problem of reef occurrence. Considerable knowledge of the occurrence of modern reefs has been gained in recent years by studies in the South Pacific, and it is expected that eventually some of the scientists who have been on these expeditions will be brought in for consultation. As a part of this investigation, outcropping rocks and the animal and plant life they contain also are being studied and mapped.

3. The mineral technology laboratory is engaged in making analyses, physical or chemical or both, that contribute to or definitely establish the identification and classification of Texas minerals and rocks. Considerable time also is devoted to citizens who send in specimens for identification with inquiries as to their possible commercial value.

4. The petroleum-engineering oil-well-core depository is contributing to a systematic attack on the problem of increasing recovery of oil from Texas oil fields.

Over 13 billion barrels of oil has been produced in Texas to date. More than 15½ billion barrels is estimated to be in proved primary reserves. Competent authorities estimate another 15½ billion barrels of oil exists in already proved territory but cannot be recovered by production methods now in use.

The depository contains a complete set of cores from the Woodbine sand of Cayuga oil field. It is believed to be the only complete set of cores from one field in existence. This material is being studied by members of the petroleum-engineering department with particular emphasis on determining the number and sizes of pore samples and their classification, and the effect of freezing when cores contain salt water and oil.

5. The mass spectrometry section of the spectroscopy laboratory brings electronics into the field of research applicable to the oil industry. Research activities of this section are centered about the problem of determining the energies required to ionize molecules and the energies required to break the chemical bonds in the molecules, particularly in hydrocarbons.

Since many refinery operations such as cracking and alkylation involve chemical reactions, and in particular ionic chemical reactions, knowledge of bond strengths and of ionization energies can be of considerable value in interpreting the mechanisms of reactions presently in use and in predicting new reactions which might be of value.

The emission spectrographic section of the same laboratory also employs techniques of widespread practical use. Core samples are analyzed by an emission spectrograph. The data are then correlated in order to obtain variations in depth of production horizons in a particular field. This information enables an operator to evaluate the amount of oil available for production, and tells him where to set pipe to produce it.

6. The electrical-engineering research laboratory since World War II has devoted much of its time to a study of the propogation of radio waves through to lower atmosphere. This work is sponsored by the Office of Naval Research and has a direct bearing on national defense. But information that has resulted from these studies for the Navy is also of interest to the oil industry because of the development of offshore drilling in the Texas tidelands. The industry is interested because of problems arising in such areas as communications, navigation, and radar storm detection.

A correlation computer or "electronic brain' developed by staff members of the same laboratory for use in radio wave studies also has proved of benefit to oil men. The instrument recently was used to analyze seismographic data which were developed in a series of tests by The Texas Co.

TEXAS TODAY

Texas Gas Reserves 100 Trillion Cubic Feet

Last year 55 per cent of marketed production was exported to other states

by C. A. Breitung

THE proved recoverable reserves of natural gas in Texas as of January 1955 have been shown by the American Gas Association to be 105,129,062 million cubic feet at 14.65 psia. and 60° F. The total reserves as of January 1951 were placed at 102,404,100 million cubic feet, and as of January 1946 at 75,095,800 million cubic feet.

The completion of new large-diameter gas pipelines, and the paralleling of existing lines, together with the increasing expansion of gas use in the chemical industries in Texas has tended to level off the total available gas.

Natural gas has been largely discovered in the search for oil and some 36,579,410 million cubic feet of the present reserves is shown to be associated gas with, or dissolved gas in oil in the oil reservoirs. This figure represents about 34.7 per cent of the total recoverable gas reserves of the state.

Marketable gas . . . A survey of the net gas for market shows the following totals (millions of cubic feet, 14.65 psia. at 60° F.):

1945	2,019,400
1946	2,072,000
1947	2,197,800
1948	2,541,300
1949	2,721,200
1950	3,134,300
1951	3,816,600
1952	4,303,600
1953	4,534,000
1954	4,268,500
Total	31,608,700

Marketable production in 1954 is the total gas to transmission lines, carbon black, plant fuel, and lease use. Previous years included extraction loss and gas vented, amounting to 192,718 million cubic feet in 1954. It may be noted that the net gas for market has increased about 2.2 times in the last 10 years, and likely will continue to increase with the state and national consumption.

In 1954, of the 4,268,562 million cubic feet of marketed production, some 2,365,061 million cubic feet of gas was exported from Texas, or around 55.5 per cent. This ratio may or may not increase, as further chemical industries expand or establish themselves in Texas.

The present trend of net gas for market will likely reach a total of 6,000,000 million cubic feet per year some time during the next 10 years. On the basis of the present gas-reserve total of 105,129,062 million cubic feet, the available reserves would represent 20 to 30 years' supply.

Reserves . . . The associated and dissolved-gas reserves in Texas are located largely in some 65 giant oil fields which have estimated ultimate oil reserves of 10,371 million barrels, and represent about 69 per cent of the total recoverable oil in Texas.

The nonassociated recoverable gas reserves estimated at 68,536,351 million cubic feet as of January 1955, are largely located in 22 major gas fields, most of which have multiple reservoirs, and represent about 66 per cent of the total recoverable gas.

There were as of January 1955 about 4,539 listed oil fields in Texas, and 3,648 separate gas reservoirs located in 1,559 fields. Texas had 11,224 gas wells which were producing gas and 101,629 oil wells reporting casing-head-gas production at the first of the year.

An unofficial summary of the estimated recoverable gas reserves in Texas shows variations on the associated and the nonassociated gas, as reported by the A.G.A. There is a difference of 10,060.5 million cubic feet in the dissolved and associated-gas total, most of which has been included in the nonassociated gas total, which has attempted to conform to the list of nonassociated gas reservoirs published by the Railroad Commission of Texas.

A large volume of these gas reserves is under long-term gas-purchase contracts. In certain cases the annual volume of production required by the contract will have a tendency to prolong the life of the field well beyond 20 years. It can be stated that there are gas reserves of large volume which have never been contracted for, held for future developments largely by major oil companies, who can foresee the time when hydrocarbons will become more valuable in the chemical production of a multitude of products.

It is felt that economic conditions will warrant the continued use of natural gas for domestic, commercial, and specialized industrial purposes. The use of natural gas for general industrial requirements, such as boiler and furnace fuel, will likely diminish in volume as the price range of competitive fuels equalizes.

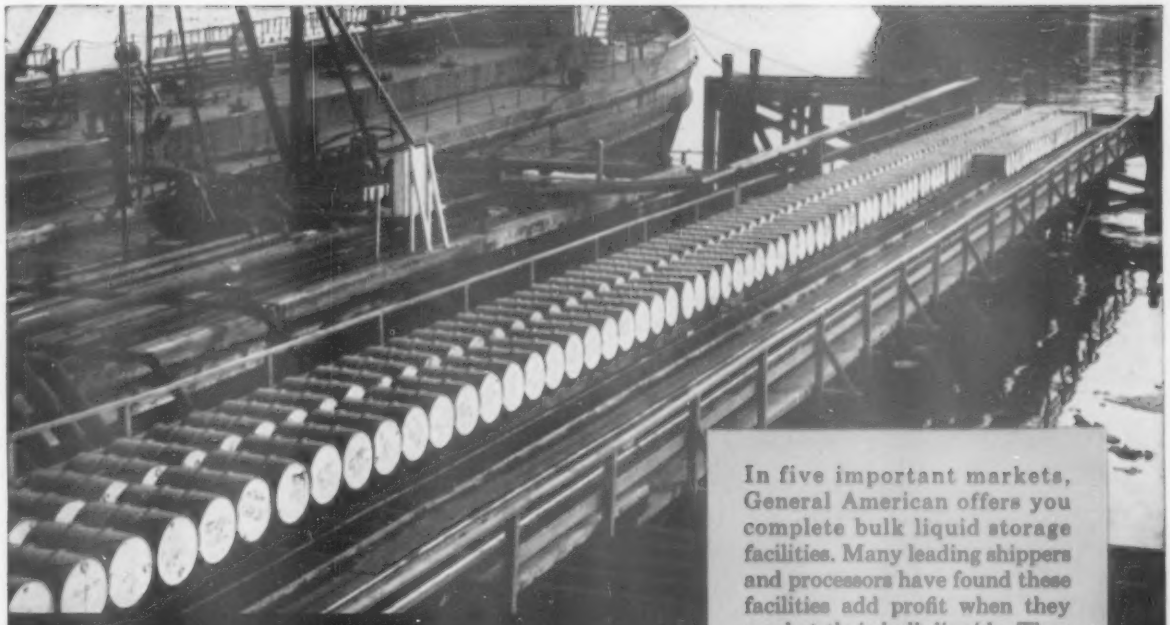
The major volumes of gas in Texas are produced and transported from the East Texas, Gulf Coast, and South Texas oil and gas fields, and from the fields in the Permian basin of West Texas and from the Texas Panhandle. The vast region of the Central and North Texas areas has not developed up to this time large volumes of gas reserves, although the area has produced a large volume of oil.

Future Status

A realistic estimate of future recoverable gas reserves yet to be discovered in Texas will include the tidelands areas off the Gulf Coast and will take into account the deeper gas-condensate reservoirs which will very likely be discovered in all parts of the state. Various factors will enter into the time schedule. Increasing domestic demand of petroleum products, as balanced against the world supply and price of crude, will have a determining influence on the rate of the drilling program. A con-

THE AUTHOR

Charles A. Breitung is oil and gas consultant, Austin, Tex. He is a graduate of University of Michigan, and has had a distinguished career in the field of natural gas engineering. He first entered the consulting field in 1922, concentrating his practice in Louisiana, and Oklahoma.



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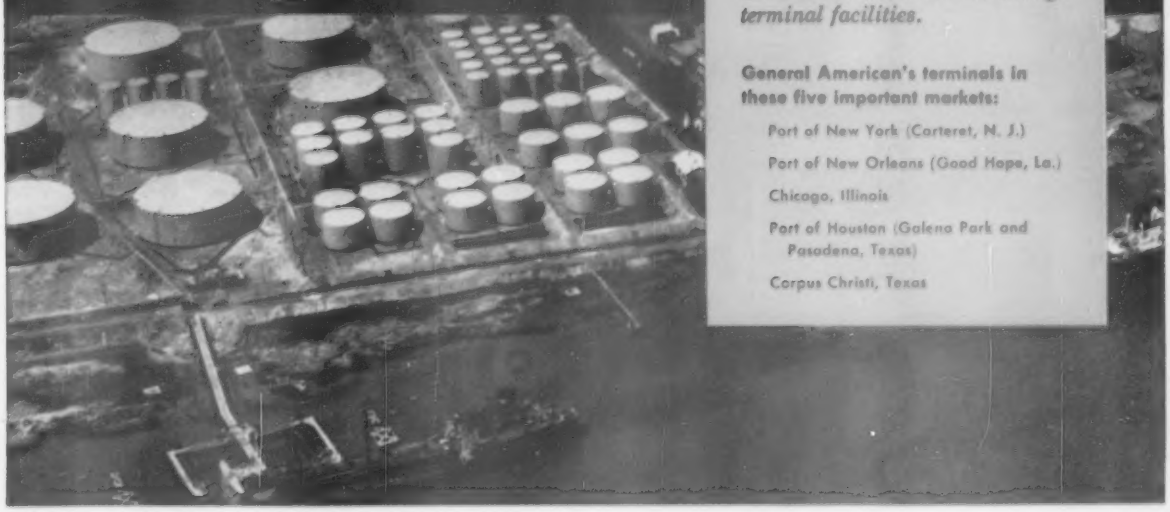
Corpus Christi, Texas



sistent drilling program will discover additional oil and gas reserves, some of which will be of size. The federal regulation in part of the producing end of natural gas, with its ultimate threat of regulation of oil production as well, must be clarified in order to continue the progressive development of future gas reserves. At present the issue is obscured, while the more densely populated eastern and middle western states have the feeling that federal regulation will continue to hold down the price of natural gas to the consumer, regardless of the free competition with other fuels in the open market.

It can be stated that drilling in the tidelands areas and the deeper drilling of oil and gas wells on the mainland will require much larger capital expenditures than heretofore. Also the exploration expense in finding new reserves is an ever-increasing figure. These costs will require higher prices for the oil and gas produced.

It is quite likely that discoveries of oil and gas reserves in the presently

Estimated Recoverable Gas Reserves in

SUMMARY BY DISTRICTS
(Billions of cubic feet—14.65 psia. at 60° F.)

	Dissolved and associated	Nonassociated	Total
Railroad Commission:			
Dist. 1	120.2	273.3	393.5
Dist. 2	1,668.2	5,506.9	7,175.1
Dist. 3	5,980.4	20,329.8	26,310.2
Dist. 4	1,334.3	19,415.0	20,749.3
Dist. 5	272.2	1,079.4	1,351.6
Dist. 6	2,157.6	9,944.3	12,101.9
Dist. 7-B	315.4	260.7	576.1
Dist. 7-C	1,717.9	664.0	2,381.9
Dist. 8	11,385.2	1,148.7	12,533.9
Dist. 9	722.8	627.8	1,350.6
Dist. 10	844.7	19,233.0	20,077.7
Total	26,518.9	74,482.9	105,001.8

SUMMARY BY COUNTIES
(Billions of cubic feet—14.65 psia. at 60° F.)

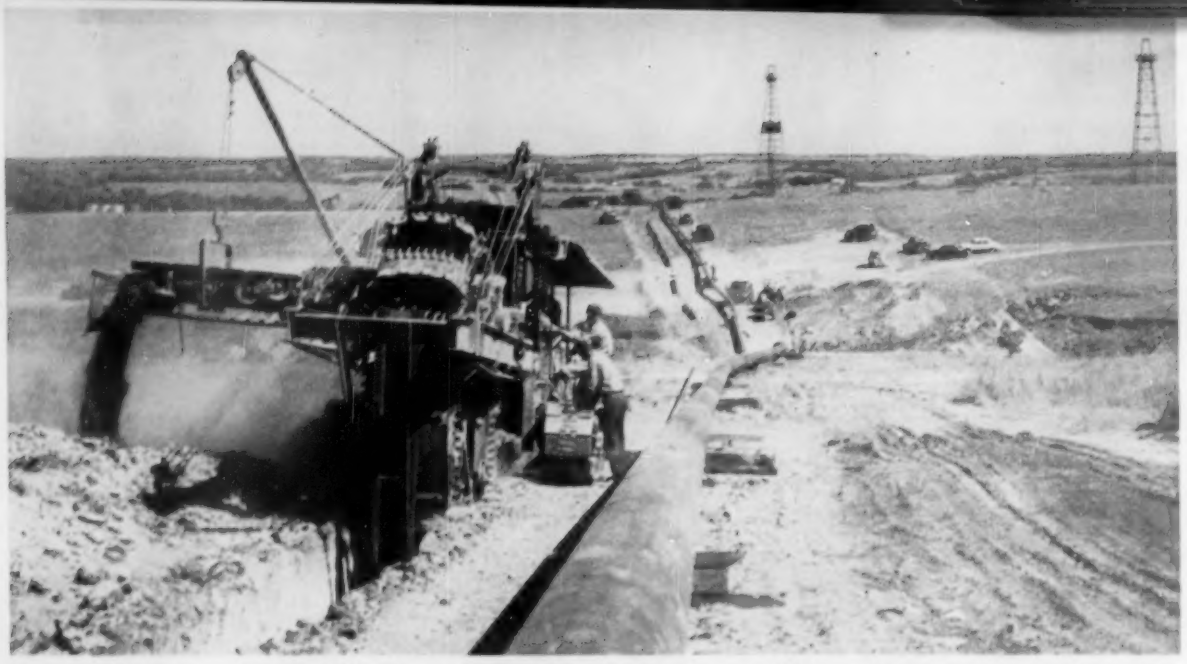
	Dissolved and associated	Nonassociated	Total
Railroad Comm. Dist. 1:			
Atascosa	45.2	13.9	59.1
Bastrop	0.8	1.2	2.0
Bexar	0.9	.....	0.9
Caldwell	12.2	.....	12.2
Dimmit	negligible	3.6	3.6
Edwards	negligible	.....	.....
Frio	25.5	45.7	71.2
Guadalupe	10.4	4.1	14.5
LaSalle	4.2	1.5	5.7
Maverick	.....	2.8	2.8
McMullen	18.2	41.4	59.6
Medina	negligible	.....	.....
Milam	0.7	.....	0.7
Travis	negligible	.....	.....
Val Verde	.....	124.9	124.9
Williamson	1.3	.....	1.3
Wilson	0.8	.....	0.8
Zavala	negligible	34.2	34.2
Total	120.2	273.3	393.5
Railroad Comm. Dist. 2:			
Bee	43.9	383.4	427.3
Calhoun	36.1	389.2	425.3
DeWitt	0.6	241.4	242.0
Goliad	45.4	481.8	527.2
Jackson	783.7	506.9	1,290.6
Karnes	15.4	189.9	205.3
Lavaca	1.9	334.3	336.2
Live Oak	1.2	707.1	708.3
Refugio	514.4	1,250.6	1,765.0
Victoria	225.6	1,022.3	1,247.9
Total	1,668.2	5,506.9	7,175.1
Railroad Comm. Dist. 3:			
Austin	52.3	218.3	270.6
Brazoria	1,660.2	4,860.1	6,520.3
Brazos	.....	9.2	9.2
Burleson	negligible	.....	.....
Chambers	649.9	1,017.1	1,667.0
Colorado	3.8	1,702.8	1,706.6
Fayette	1.2	0.4	1.6
Fort Bend	387.6	393.8	781.4
Galveston	214.2	429.3	643.5
Grimes	negligible	.....	.....
Hardin	259.9	306.2	566.1
Harris	1,142.7	977.5	2,120.2
Jasper	negligible	.....	.....
Jefferson	183.2	736.4	919.6
Lee	negligible	.....	.....
Liberty	182.9	258.1	441.0
Madison	negligible	110.7	110.7
Matagorda	214.2	1,372.7	1,586.9
Montgomery	660.6	502.2	1,162.8
Newton	10.5	35.3	45.8
Orange	60.4	273.7	334.1
Polk	54.1	49.1	103.2
San Jacinto	21.2	85.1	106.3
Trinity	.....	28.0	28.0
Tyler	4.9	90.3	95.2
Walker	0.6	.....	0.6
Waller	2.7	5,924.6	5,927.3
Washington	3.8	14.2	18.0
Wharton	209.5	934.7	1,144.2
Total	5,980.4	20,329.8	26,310.2
Railroad Comm. Dist. 4:			
Aransas	16.2	633.2	649.4
Brooks	28.2	3,560.8	3,589.0
Cameron (included with Hidalgo)	.....	.....	.....
Duval	246.3	1,081.5	1,327.8
Hidalgo	4.1	3,555.5	3,559.6
Jim Hogg	6.6	101.6	108.2
Jim Wells	297.7	3,073.0	3,370.7
Kenedy	2.6	266.8	269.4
Kleburg	15.5	327.6	343.1
Nueces	409.9	5,223.6	5,633.5
San Patricio	200.2	545.1	745.3
Starr	44.4	709.8	754.2
Webb	45.6	30.3	75.9
Willacy	12.5	163.5	176.0
Zapata	4.5	142.7	147.2
Total	1,334.3	19,415.0	20,749.3
Railroad Comm. Dist. 5:			
Falls	negligible	.....	.....
Fannin	.....	negligible	.....
Freestone	0.7	363.0	363.7
Grayson	22.6	16.3	38.9
Henderson	12.1	248.3	260.4
Hill	.....	negligible	.....
Hopkins	34.3	.....	34.3
Hunt	1.6	.....	1.6
Kaufman	3.1	.....	3.1
Leon	9.1	343.1	352.2
Limestone	10.4	79.8	90.2
McLennan	negligible	.....	.....
Navarro	18.8	7.6	26.4
Rains	.....	18.7	18.7
Robertson	0.8	2.6	3.4
Van Zandt	158.7	.....	158.7
Total	272.2	1,079.4	1,351.6

unexplored basins of large areal extent in the western states of the United States, from West Texas, western Oklahoma, western Kansas, New Mexico, Colorado, to Utah and Wyoming and Montana, will be realized during the next 20 years. A look behind, to 20 years ago, will demonstrate the fact that the known reserves of natural gas in Texas have been greatly augmented as of today, and the future reserves are apt to continue this same trend for some time. Texas natural gas will play an important part in the furnishing of heating units and raw materials for chemical manufacture for the nation. It is difficult to predict when the leveling off will occur.

Texas as of January 1955

Texas Oilmanac Data

	Dissolved and associated	Nonassociated	Total
Railroad Comm. Dist. 6:			
Anderson	133.3	503.3	636.6
Angelina	negligible	3.0	3.0
Bowie	0.5	noncommercial	0.5
Cass	79.9	324.5	404.4
Camp	3.4		3.4
Cherokee	1.9	25.9	27.8
Franklin	50.6		50.6
Gregg	1,038.9	242.1	1,281.0
Harrison	29.7	1,154.6	1,184.3
Houston	8.6	166.2	174.8
Marion	3.4	341.9	345.3
Nacogdoches	negligible	356.8	356.8
Panola	8.8	6,007.4	6,016.2
Red River	negligible		
Rusk	12.1	125.6	137.7
San Augustine	negligible		
Shelby	negligible	290.8	290.8
Smith	65.7	302.4	368.1
Titus	29.4		29.4
Wood	691.4	99.8	791.2
Total	2,157.6	9,944.3	12,101.9
Railroad Comm. Dist. 7-B:			
Brown	4.9	23.9	28.8
Callahan	1.8	2.6	4.4
Coleman	40.2	40.1	80.3
Comanche	4.8	3.3	8.1
Eastland	29.1	28.5	57.6
Erath	0.1	13.2	13.3
Fisher	28.4	0.1	28.5
Hamilton		20.4	20.4
Haskell	9.8		9.8
Jones	60.8	0.1	60.9
Nolan	negligible	0.1	0.1
Palo Pinto	2.2	20.3	22.5
Parker	negligible	1.4	1.4
Shackelford	38.9	9.5	48.4
Stephens	64.8	96.8	161.6
Stonewall	0.3		0.3
Taylor	11.5	0.1	11.6
Throckmorton	17.8	0.3	18.1
Total	315.4	260.7	576.1
Railroad Comm. Dist. 7-C:			
Coke	136.3	3.6	139.9
Concho	negligible	2.8	2.8
Crockett	183.1	234.6	417.7
Irion	negligible	3.0	3.0
Kimble	negligible		
McCulloch	negligible	3.5	3.5
Reagan	424.7	48.8	473.5
Runnels	84.7	3.0	87.7
Schleicher	7.9	11.5	19.4
Sutton	negligible	189.1	189.1
Terrell		10.0	10.0
Tom Green	22.8	3.0	25.8
Upton	858.4	151.1	1,009.5
Total	1,717.9	664.0	2,381.9
Railroad Comm. Dist. 8:			
Andrews	1,286.6	117.8	1,404.4
Borden	131.2	12.0	143.2
Cochran	555.4	1.0	556.4
Crane	607.3	24.6	631.9
Culberson		6.4	6.4
Dawson	15.4		15.4
Ector	1,861.2	295.8	2,157.0
Gaines	446.6	124.2	570.8
Garza	49.6		49.6
Glasscock	310.1	1.0	311.1
Hale	2.2		2.2
Hockley	453.7	1.2	454.9
Howard	301.3		301.3
Kent	391.9		391.9
King	16.5	3.5	20.0
Lamb	36.3		36.3
Loving	16.7		16.7
Lubbock	0.8		0.8
Lynn	negligible		
Martin	negligible		
Midland	610.3	16.6	626.9
Mitchell	16.6		16.6
Pecos	189.2	125.9	315.1
Reeves	19.1	0.4	19.5
Scurry	1,906.9	0.2	1,907.1
Sterling	1.4		1.4
Terry	28.6		28.6
Ward	74.4	74.5	148.9
Winkler	968.5	343.6	1,312.1
Yoakum	1,087.4		1,087.4
Total	11,385.2	1,148.7	12,533.9
Railroad Comm. Dist. 9:			
Archer	152.5	0.1	152.6
Baylor	5.1		5.1
Clay	74.3	4.8	79.1
Cooke	110.4	0.8	111.2
Denton	2.5		2.5
Foard	0.3	2.1	2.4
Hardeman	negligible		
Jack	48.2	83.8	132.0
Knox	17.8		17.8
Montague	106.0	9.6	115.6
Wichita	110.7	0.7	111.4
Wilbarger	21.0		21.0
Wise	9.8	510.5	520.3
Young	64.2	15.4	79.6
Total	722.8	627.8	1,350.6
Railroad Comm. Dist. 10:			
Carson	66.8	2,179.0	2,245.8
Collingsworth	negligible	167.0	167.0
Dallam		20.0	20.0
Gray	283.5	1,995.0	2,278.5
Hansford	negligible	1,126.0	1,126.0
Hartley	negligible	284.0	284.0
Hutchinson	333.8	2,087.0	2,420.8
Moore	16.7	4,310.0	4,326.7
Ochiltree	1.0	5.0	6.0
Oldham		19.0	19.0
Potter	negligible	1,276.0	1,276.0
Roberts	8.5	75.0	83.5
Sherman	1.0	4,334.0	4,335.0
Wheeler	133.4	1,356.0	1,489.4
Total	844.7	19,233.0	20,077.7



RECENT JOB was construction of 20-in. line into Garvin County, Oklahoma, to tap prolific gas production in Golden Trend area. This line, completed in December 1952, was laid by Lone Star's pipeline department as are nearly all of the company's projects.

. . . and now we give you . . .

THE LONE STAR GAS COMPANY

How it started, how it grew, and its stature today

by Robert J. Enright

IF you write on Texas and natural-gas pipelines, you can't go far without mentioning Lone Star Gas Co.

And if you write on history of gas pipelining in Texas, you can't get started without mentioning that company, because it built the first large-diameter gas-transmission line in the state.

Lone Star is still more intimately associated with Texas than any other big gas line.

The bulk of its huge system, consisting of almost 8,000 miles of transmission and gathering lines taking gas from roughly 1,712 wells in 264 fields as of the first of the year, lies within the state. Its markets, unlike those of most of the other large lines, also are primarily in Texas.

The company's pipelines spiderweb across an area roughly 400 miles north to south and about the same distance east to west in North, East, West Central Texas and the Texas Panhandle and southern Oklahoma.

Last year it served 713,290 customers with a total of 189,221,646,000 cu. ft. of natural gas through 9,316 miles of distribution lines. It set its all-time peak-day record last year on January

22 when it delivered 1,166,300,000 cu. ft.

At the first of this year, Lone Star's property, plant, and equipment were valued at almost $300,000,000, and its operating revenues stood at $78,102,-102.

Lone Star does a lot more than gather, transport, and distribute gas. It, via its subsidiary Lone Star Producing Co., explores and drills for petroleum and supplies much of its own gas requirements.

It operates three underground-storage reservoirs with a working capacity of about 11.5 billion cubic feet of gas. It has 35 compressor stations in operation, some of them automatic, totaling 56,860 hp.

Its 27 treating plans—dehydration or desulfurization or both—have a total design capacity of almost 850,000,000 cu. ft. a day. The organization operates nine gasoline plants, three cycling plants, and one fractionation plant. These 13 plants last year processed more than 50 billion cubic feet of gas and produced about 4,234,000 bbl. of natural gasoline, L.P.G., kerosine, distillate, and condensate.

How Lone Star Was Born

Lone Star didn't come by all of this easily. In fact, there were several periods during its history when it appeared there shortly wouldn't be any Lone Star Gas Co.

Lone Star Gas Co. was formed in 1909. The gas industry in Texas at this time consisted of two small distribution plants, one in Marshall, the other in Corsicana. The first gas well in the state was drilled for Corsicana Refining Co. and completed January 25, 1901. Corsicana was the first city in Texas to be served with natural gas through a city distribution system.

By 1909 Corsicana Refining had expanded considerably. It controlled considerable acreage in North Texas in the Petrolia area and had drilled several gas wells. Lone Star was the idea of one of the owners of Corsicana Refining, C. N. Payne.

Announcing the new

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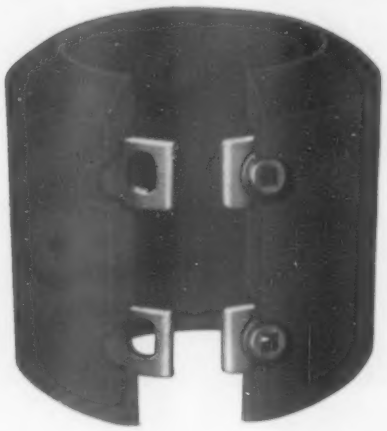
drill pipe & casing

PROTECTORS

pay for themselves in rig time saved!



Quickly installed or removed by your own crew!

New PB Safe-Lok Protectors (formerly known as Vetco OFF-N-ON Protectors) pay for themselves in rig time saved. Your regular drilling crews can install or remove them – in seconds – using just a simple wrench. You eliminate the time and trouble of laying down and picking up rubbered pipe while drilling. You do away with special handling and storing of rubbered pipe and costly shipment of rubbered pipe from one drilling site to another.

New PB Safe-Lok Protectors have all the time-tested stamina of PB oil field rubber products *plus* this patented, money-saving installation and removal feature. Safe-Lok Protectors are available in a range of sizes and lengths for drill pipe sizes from 3½" to 5½". Ask any BJ-PB field sales engineer or write to address below.

results talk!

Lease X-41. Set 1160' of 11¾" casing. Used forty Safe-Lok Protectors (size 4½" x 8") from 1200' to 12,564'. Made 96 round trips – eliminated laying down 6 to 15 singles each trip. Saved 15 to 25 minutes per trip or a total of 28 hours. At $60 per hour, this one hole saved $1680!

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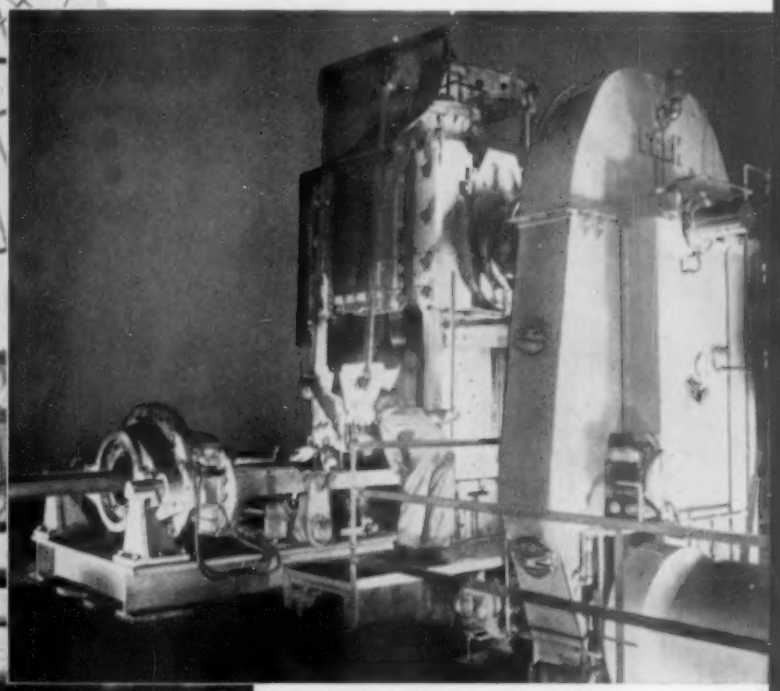

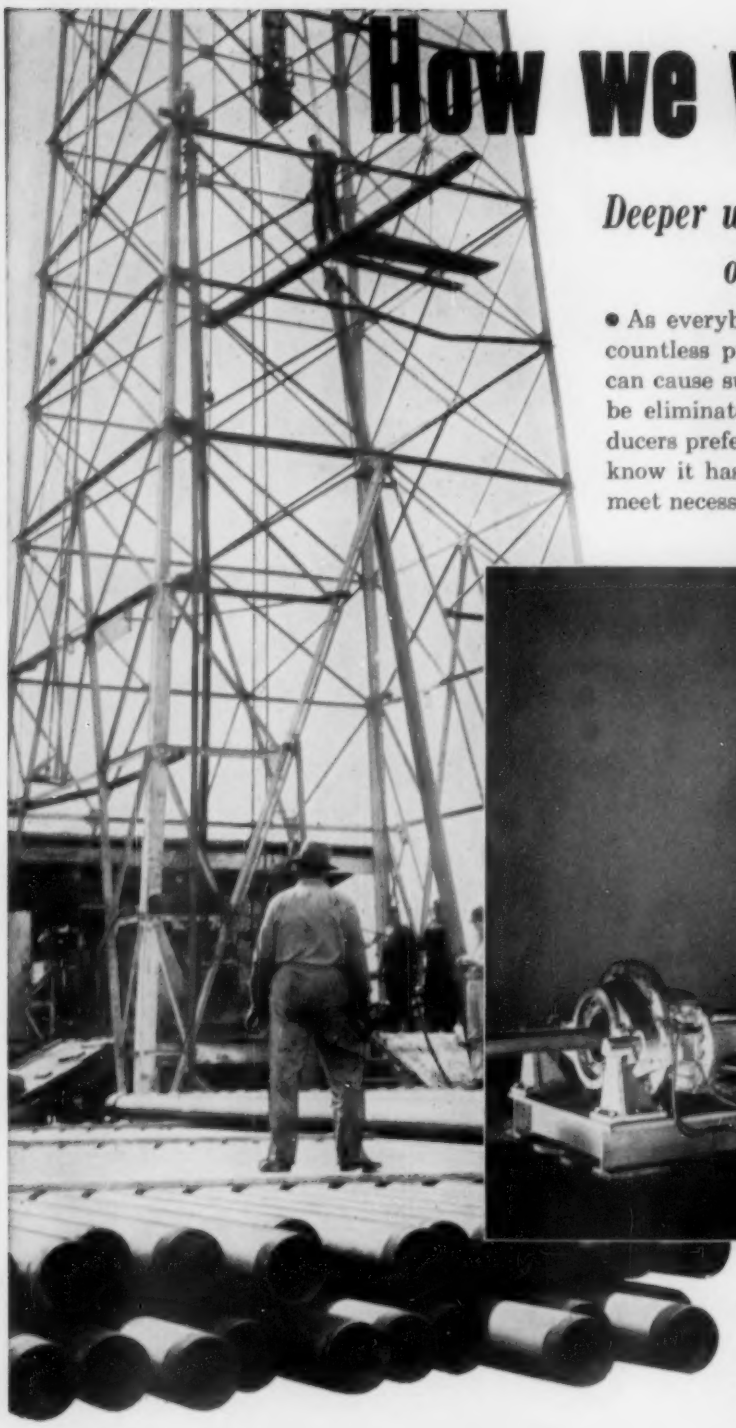

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A. O. Smith's unique "cold-working" process produces casing of far greater strength and dimensional accuracy. This cold-working actually increases the yield point of the steel in compression to withstand the extreme weight and pressures encountered today.

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How

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steel

to make steel work for you

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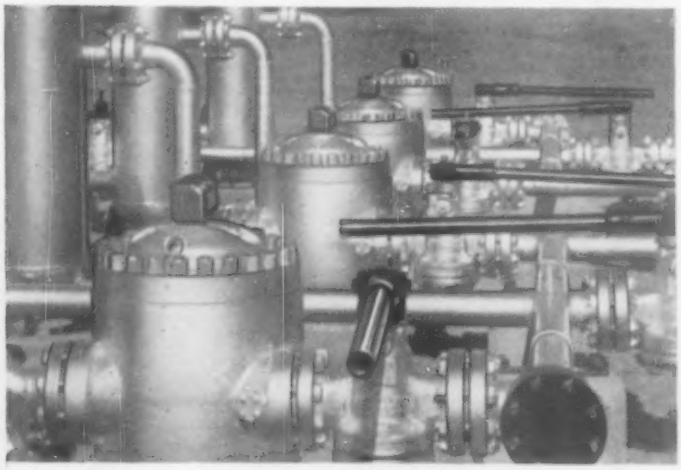

Dependable vertical turbine pumps

A. O. Smith vertical turbine pumps are specifically designed for a variety of petroleum industry applications. Units pictured above are pumping high octane gasoline at an airport.

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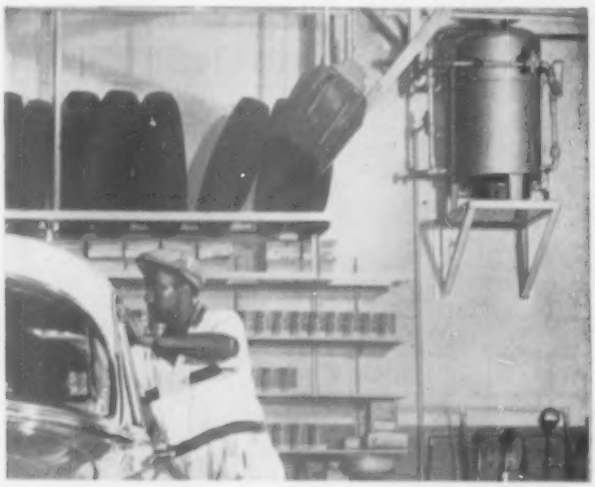
Service helps determine a station's profit picture, and here's a valuable profit booster. It's the A. O. Smith *Burkay* water heater that gives you a steady supply of hot water the year around. You wash more cars faster . . . bring in more TBA customers. You do a better job of building repeat business . . . keeping your employees happy by making car-washing so much easier.



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Payne suggested a merger of these gas properties with those of a partnership of M. E. Treat, of Pasadena, Calif., and George W. Crawford, of Pittsburgh. Treat and Crawford had assembled lease blocks in Clay, Montague, Archer, Young, and Shackelford counties in North Texas and drilled two wells in Petrolia field in Clay County.

Payne's idea, which contemplated serving Fort Worth and Dallas with natural gas, appealed to Treat and Crawford. The latter two sent L. B. Denning, later a president of Lone Star, to Dallas to represent their interests in merger talks.

Denning conferred with representatives of the Corsicana company at the old Oriental Hotel in Dallas on June 1, 1909. An agreement was reached and Denning applied for a charter for Lone Star Gas Co. Heading the negotiators for Corsicana Refining was E. R. Brown, later president of Magnolia Petroleum Co.

Lone Star got its charter June 4, 1909. Denning, W. Paul Gage, and J. W. Ricker were named incorporators. H. C. Edrington was elected president, and Brown vice president.

The new company bought from Edrington a 4-in. pipe line from Petrolia to Wichita Falls and Henrietta and 12 gas wells. Its first customer was Clayco Oil & Pipe Line Co. which had franchises in Wichita Falls, Henrietta, and Petrolia.

First line started . . . Later in the year Lone Star started construction of the Southwest's first long-distance, big-inch (16-in.) pipeline from Petrolia field to Fort Worth. Pipe and couplings for the 95-mile line were shipped by water to Galveston and then hauled overland to right-of-way locations.

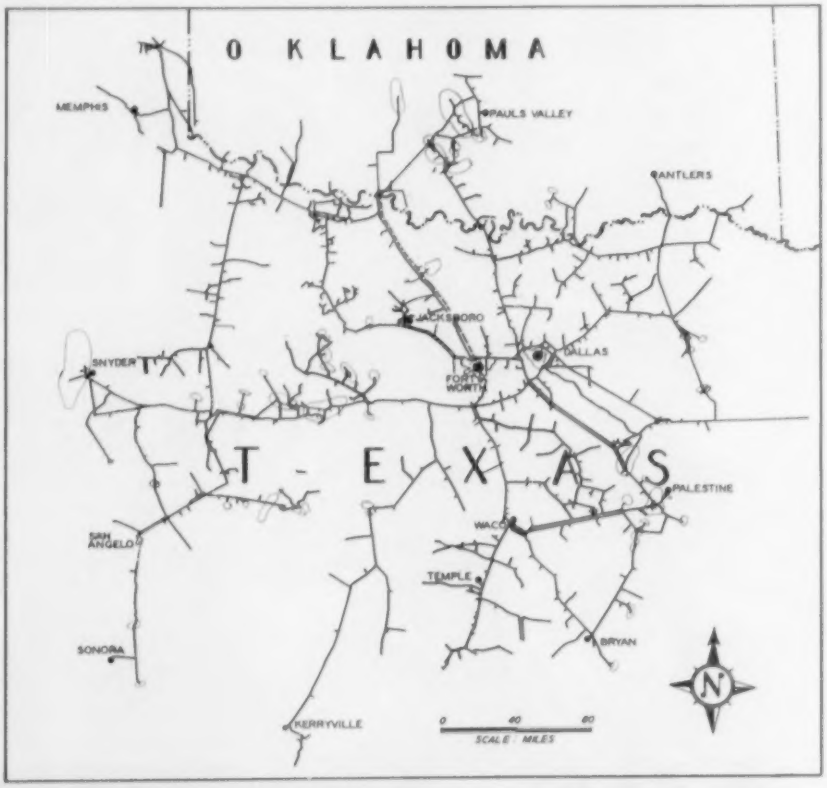
The line was completed and service begun to Fort Worth February 22, 1910. An extension to Dallas was finished 2 months later. Distribution plants were built by Clayco and its successor, North Texas Gas Co. During its first year of operation Lone Star

THE LONE STAR SYSTEM

. . . and the men who direct it

THE BULK of the Lone Star system, almost 8,000 miles of transmission and gathering lines taking gas from 1,715 wells in 264 fields, lies within the State of Texas. Its lines spider-web across an area roughly 400 miles north to south and about the same distance east to west.

TEXAS TODAY



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CHESTER L. MAY
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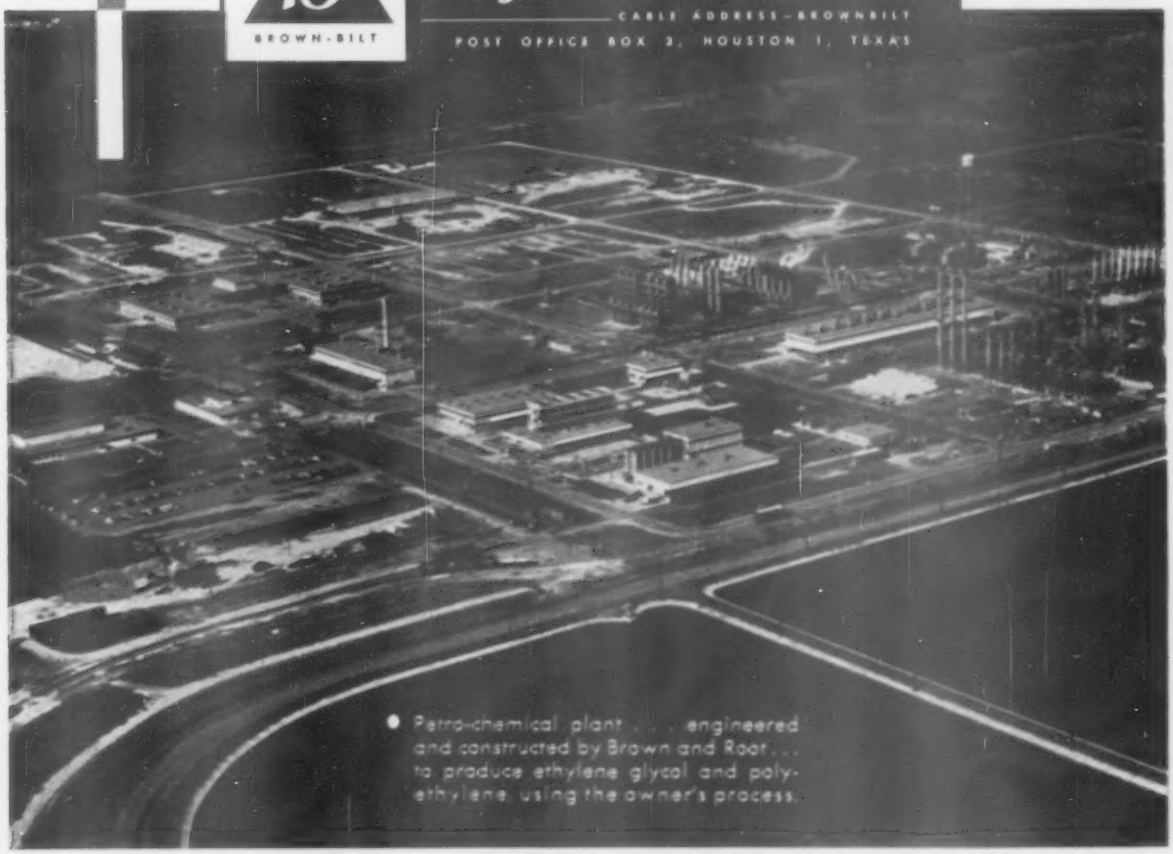

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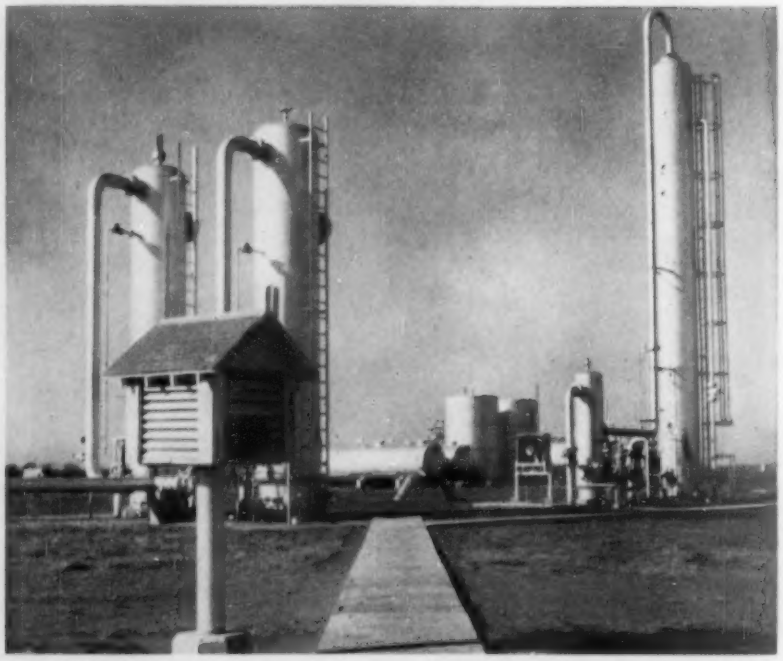
THEN

PINTSCH GAS PLANT in Fort Worth (above) originally stored manufactured gas for lighting railway cars in 1912. Gas was replaced with natural when Lone Star completed its line from Petrolia field in 1910.

MULE-DRAWN WELDING UNITS (right) push Lone Star pipeline through Texas corn field to new gas supply in company's early days.



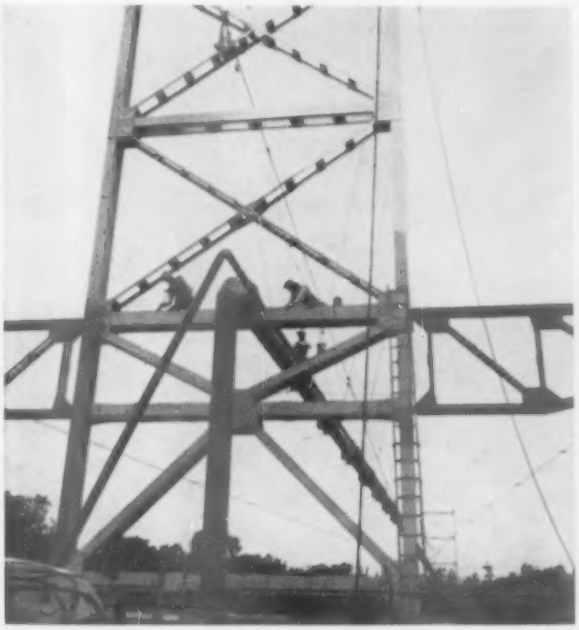
. . . AND NOW **RADIO COMMUNICATION has saved Lone Star thousands of dollars. At left Aubrey Boyd, pipeline foreman of company's East Texas area, saves a few more dollars by summoning additional men and materials via one of organization's 250-plus mobile units. Right, Katie gasoline plant near Elmore City in Garvin County, Oklahoma, is one of Lone Star organizations' 13 main-line plants.**

piped 1.75 billion cubic feet of Petrolia gas through its system.

The company kicked off its first sizable expansion in 1913, laying about 80 miles of 10 and 12-in. transmission lines in the Gainesville, Sherman, and Denison areas. The company meanwhile began serving more communities and in 1913 had hiked its yearly throughput to about 11.5 billion cubic feet.

It built the first major compressor station in the state at Petrolia in December 1914. A year later Edrington died, and Denning was named president.

Lone Star in 1916 built what is believed to be the first gasoline plant in the Southwest, after a year of pilot tests which indicated that the relatively wet gas produced in Petrolia field



BIG SUSPENSION BRIDGE over Brazos River 2 miles east of Waco, Tex., gets new coat of paint from Lone Star structure-maintenance crew. Company has five suspension bridges over Brazos and Red River (or its tributaries). Each is painted every 6 or 7 years. Topmost painter rides in company-designed boatswain's chair.

GAS SUPPLY was bolstered in 1948 when Lone Star laid a new 70-mile, 20-in. line from Dallas to Opelika in East Texas to tap new sources. Company at same time laid a 10-in. line from near Sulphur Springs to near Paris to increase flexibility and deliverability in that area.

TEXAS TODAY

could be made more suitable for transmission.

The plant was then called a "gas-drier." It was a duplicate of a similar installation in operation in Ohio. The plant was operated manually by five men a tour, since controls and instruments weren't available at that time. New features at the original plant and in subsequent additions to it included refrigeration of lean oil, burial of storage tanks, low-temperature low-pressure stabilizers, and over-head storage at the loading rack to provide gravity feed into tank cars.

Facilities for stripping the rich oil resembled those at a crude-oil topping plant, with glass look-boxes and stoneware in the still. Bubble-tray absorbers were unknown then, and intimate contact between the inlet and the lean oil was obtained by means of wooden baffles in the absorber. Pressure on the separator was about 300 psi. Construction of this plant was under the supervision of C. M. Baker, then chief engineer for Lone Star.

Lone Star's discovery of the refrigeration of lean-oil process of extracting gas liquids was due indirectly to the Government. At war in 1917, the United States pursued an active search for helium, examining gas from nearly every field in the country. It found its only feasible source in Petrolia field.

Lone Star officials and technicians worked with the Government to devise a plant which could efficiently extract helium from the Petrolia gas. One of the most vexing problems was that hydrates and other liquids condensing out of the gas caused clogging of the helium-extraction equipment. Refrigeration was developed by E. F. Schmidt, who retired from active duty as vice president of Lone Star only recently. The process enabled the company to increase gasoline recovery from 50 to 75 per cent.

Dark days . . . Between 1917 and 1924 Lone Star encountered its darkest days. During the war, labor was scarce and money and materials for expansion and operation were almost nonexistent. The company could get no credit and its gas supply was rapidly falling below its needs. Conservation then was just a dream.

Lone Star built pipelines to new sources of supply only to see the gas flared or vented away before the lines could be completed or shortly afterward.

In 1918, Lone Star laid about 80 miles of 10 and 12-in. line to take Oklahoma gas for the first time from fields in Stephens, Carter, and Cotton counties. One of these lines was laid to Fox field in Carter County. This field had only two wells, and the company had no contracts for purchase of gas from either of them.

Another line went to near Keys Corner in Cotton County to tap a new supply there. Two years later this supply declined below sufficiency.

In 1919, the company laid a 100-mile, 18-in. line from Joshua in Johnson County to Stephens and Eastland counties in West Central Texas. The gas supply in this area was blown into the air before line could be completed. Not enough gas was obtained from this source in the next 5 years to pay operating expenses, much less taxes, investment return, and depreciation.

During this period, Lone Star faced receivership proceedings on three separate occasions because of its inability to develop adequate sources of gas. It was forced to borrow money at interest rates as high as 15 per cent.

Things look up . . . In 1922, desperate for gas, Lone Star started using relatively wet casing-head gas from West Central Texas, but it caused the company considerable trouble due to high and variable heating values of the gas. Company engineers began to search for a method to make such gas more suitable for pipeline use.

They found the answer in 1924 with what Lone Star called its "calorific control" method. That year Lone Star built a plant at Joshua which stabilized the heating value of the wet gas at a value equal to that of dry gas from

FULLY *Automatic!*

. . . Latest COOPER-BESSEMER GMWA

Compressor Station

Development . . .

NOW, by merely energizing a *single*-switch control, a 2,000 hp Cooper-Bessemer engine-driven GMWA compressor is started and put on line. That's exactly what takes place at Northern Natural Gas Company's mainline station in Mullinville, Kansas . . . worked out jointly by Northern Natural and Cooper-Bessemer.

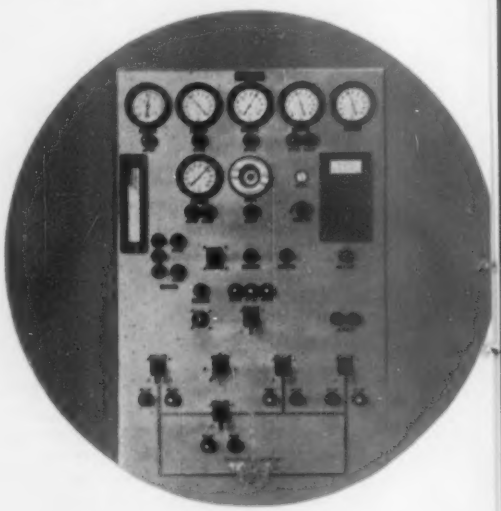
This will be welcome news to all who are familiar with the intense competition between different methods of moving gas through pipe lines. It means you can now continue to experience the greatly superior fuel economy of the reciprocating gas engine and at the same time benefit from all the other economies claimed for competing equipment.

Impressive results at Northern Natural are typical of the Cooper-Bessemer development work that continues day after day. Next time you need heavy-duty engines or compressors, first find out about the *newest* advancements being offered by one of America's oldest engine builders . . . Cooper-Bessemer. Detailed information and complete-line bulletins are readily available from the Cooper-Bessemer office nearest you.

This interior view of the station shows the 2,000 hp Cooper-Bessemer GMWA, and in the background the control panel used for automatic single-switch compressor operation.

Shown here from the compressor cylinder side is the Cooper-Bessemer GMWA compressor in the Mullinville, Kansas Station of Northern Natural.

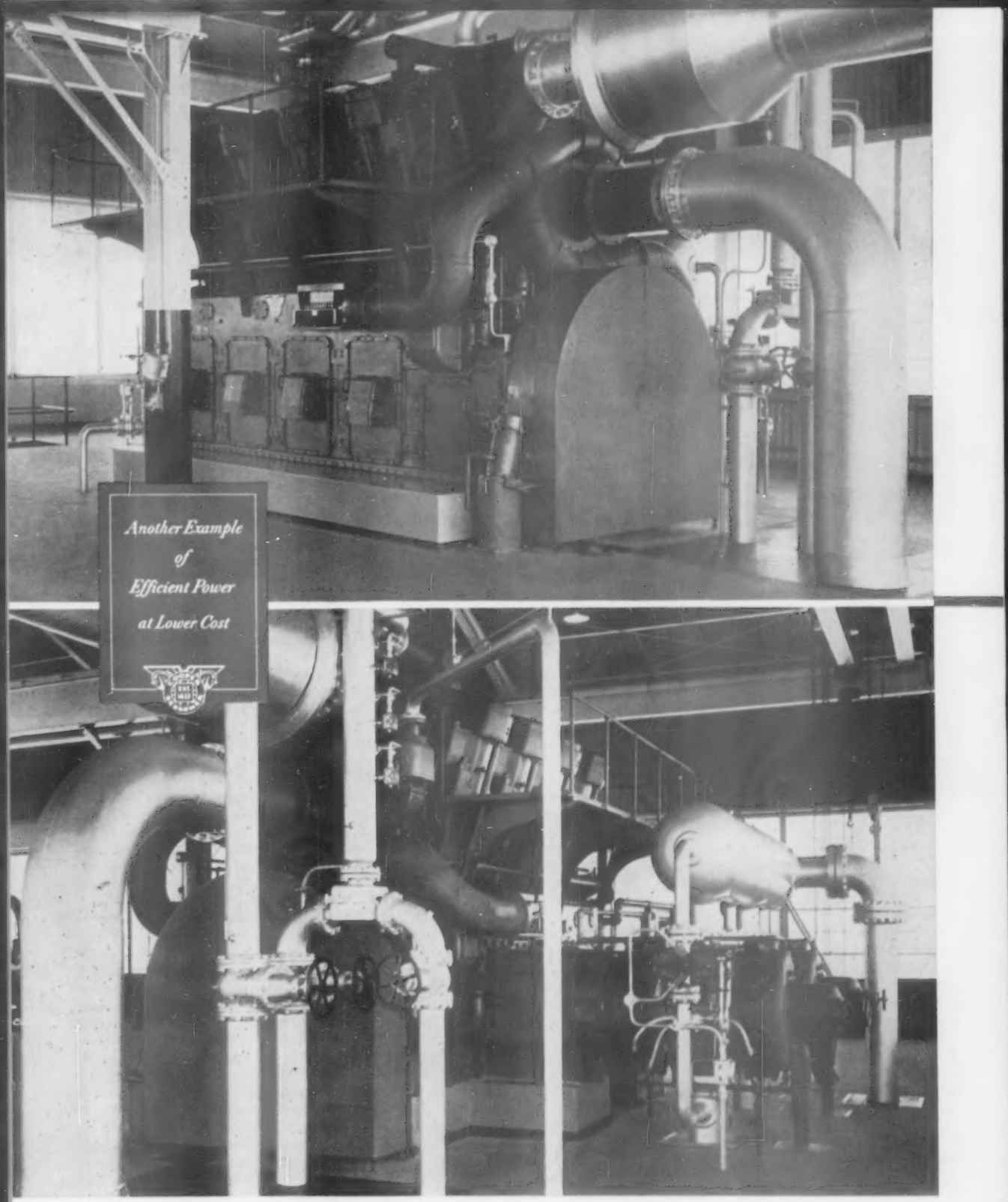
Here's a close-up of the control panel for automatic single-switch operation of the 8-cylinder GMWA reciprocating compressor.



ANGLE

Compressors

New York Washington, D. C. Bradford, Pa. Parkersburg, W. Va.
San Francisco, Cal. Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle, Wash.

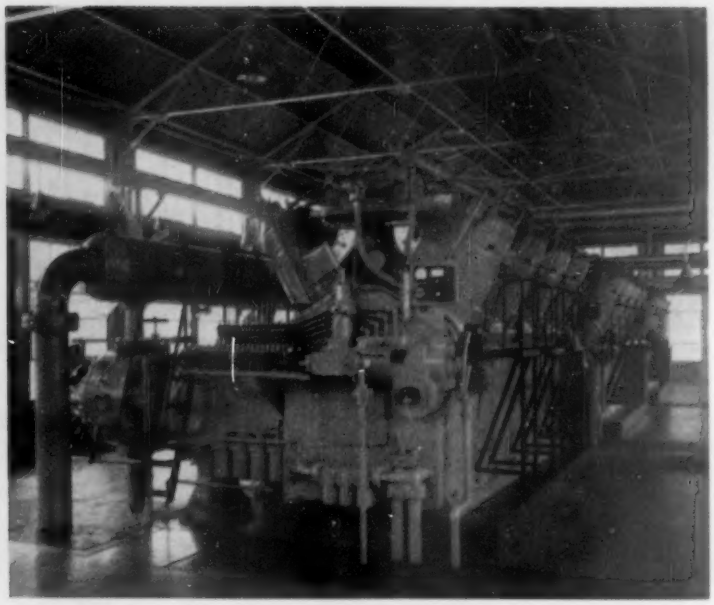


by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela

BIGGEST JOB this year so far was construction of a 22-mile, 18-in. spur from a connection in Dallas County to Texas Power & Light Co.'s plant.



COMPRESSOR STATION at Fox, Okla., is second largest of the company's 35 stations, ranking behind only the installation at Petrolia. Horsepower totals 3,660. Station has three angle-type and six horizontal-type engines. It was built in 1920.

other fields, permitting interchangeable use of gas from all company sources. This is hailed as one of the greatest contributions ever made to gas conservation.

The largest of the many problems conquered by the company in accomplishing this was the elimination of a terrific corrosion rate in the test plants. Lone Star technicians determined that corrosion of plant and distribution lines was due largely to oxides of nitrogen formed during the normal combustion of natural gas. These oxides when cooled and compressed in the presence of oxygen and water formed nitric acid which attacked lines and plant equipment.

The engineers discovered that they could stop the formation of these oxides by burning the gas under controlled conditions.

Lone Star also was plagued with the necessity for removing small concentrations of hydrogen sulfide from the West Central Texas gas which also contained traces of oxygen. None of the then-known processes would work in that particular application. The engineers again developed a process to extract the hydrogen sulfide. Both processes were patented.

Success of the Joshua plant meant that the company's gas-supply headaches were over. It could and did take large volumes of casing head from absorption plants in West Central Texas. And from this time, Lone Star began to expand in many directions.

In 1926, the company laid an 18-in. line northwest from Petrolia to Shamrock to tap immense reserves in the Texas Panhandle gas fields, finally disposing of any last worries about gas supply. The company then turned its attention to distribution.

The firms then distributing Lone Star gas had reached their limit of expansion. The company decided it must enter the distributing business to expand markets for its growing gas supply.

Lone Star Gas Corp. was set up as a holding company in Pittsburgh in 1926 with Denning as president. It acquired the stock of Lone Star Gas Co. and actively began to acquire distribution plants and to organize other firms to build and operate additional systems. The organization acquired distribution lines and properties of The Texas Co. in 1927, including facilities for serving 70 communities.

It bought out Dallas Gas Co. in 1927, Texas Cities Gas Co. (Galveston, El Paso, Waco, and others) in 1929, and Fort Worth Gas Co. in 1931 in addition to others.

Lone Star meantime was drilling wells and tapping new fields in the Texas Panhandle. It built a new 20-in. line from Petrolia to Fort Worth in 1929.

In 1930, Lone Star helped organize and obtained a 30 per cent interest in Northern Natural Gas Co. which was to serve many middle western states as far north as Minnesota with gas from the Panhandle-Hugoton area. Northern that year started construction of a new 24-in. pipeline from the Texas Panhandle to Lincoln, Neb.

By the end of 1931 Lone Star's transmission system had been expanded to 4,000 miles of lines. The company eliminated that year the last of the hazardous underwater crossings of the Red River between Texas and Oklahoma with a 1,760-ft. suspension bridge.

East Texas entry . . . In 1934, the company laid a new 70-mile line from Long Lake field in Leon, Freestone, and Anderson counties to Waco. This marked its first entry into East Texas after new gas supplies. The next year, it laid a 110-mile, 20-in. carrier from Irving (just west of Dallas) to Lone Lake via Cayuga and added 110,000,000 cu. ft. per day more to its gas supply.

The company continued to build new lines and compressor stations during the middle and late 30's. During this period, Lone Star engineers cooperated with technicians from Northern Natural to develop processes which have proved highly important to the natural-gas industry.

One of these was the use of diethylene glycol to dehydrate gas on a commercial scale. The other involved the addition of a suitable amine to the glycol to accomplish simultaneous dehydration and desulfurization of sour natural gas. The latter was carried out in the face of positive statements from competent engineers that the process would not work.

Northern Natural installed the first full-sized plants of this type on its system in 1937. Lone Star built its first

one in 1939 at Shamrock field in the Texas Panhandle.

New management . . . L. B. Denning died in 1940 and the current president, D. A. Hulcy, took over the Lone Star reins. Elmer Schmidt was elected vice president and a director.

By this time Lone Star was taking about 44.5 billion cubic feet of gas a year into 4,812 miles of lines. Almost half (42.4 per cent) of the gas was casing head. About 17.5 billion was from West Central Texas, about 8.5 billion from the Panhandle, about 18.5 billion from East Texas, and only about 0.15 billion from Petrolia.

The same year, Lone Star began cycling operations in a Woodbine sand reservoir near Grapeland in Houston County. This was one of the earliest cycling operations in the state, believed to be the second in fact.

A year later the company took over the operation of a cycling plant at Opelika in East Texas.

Reorganization . . . In 1943, Lone Star Gas Corp., the holding company, was dissolved on order of the Securities Exchange Commission acting under the Public Utility Holding Company Act of 1935.

SEC ordered Lone Star to divest itself of its interests in Northern Natural, Council Bluffs Gas Co., and the Galveston and El Paso distribution facilities as not consistent with the geographical - integration requirements of the act.

All this was completed by January 26, 1944. Lone Star sold its Council Bluffs, El Paso, and Galveston properties. It distributed its stock holdings in Northern Natural to its stockholders as a dividend.

All remaining assets were vested in two new Texas corporations—Lone Star Gas Co. and Lone Star Producing Co.

By 1946 Lone Star Gas was selling almost 90 billion cubic feet of gas a year, and its pipelines totaled more than 5,000 linear miles. A new 79-mile line was laid from Opelika to huge Carthage field in East Texas and a Carthage cycling plant was completed by the company in August.

Lone Star launched a $65,000,000 expansion program in 1949, and by 1950 this drive had pushed value of property, plant, and equipment to over $200,000,000. During 1950, the company tapped new gas supplies in Scurry County, and Katy and Bronte fields, and laid a new line to Jack and Wise counties. It opened its first underground storage project in 1950 in Leeroy field north of Cisco in Stephens County. Working capacity was almost 5 billion cubic feet.

United purchase . . . In 1952 the company added 983 miles of transmission and gathering lines to its system. It acquired 633 miles of these lines through purchase of the United Gas Corp. system's Wichita Falls district in North Texas.

The company laid a 70-mile, 20-in. line from Petrolia in Clay County, Texas, to take gas from the Golden Trend area of Garvin County, Oklahoma, and a 30-mile, 12-in. line from Page field in Schleicher County to Miers field of Sutton County, Texas, to connect new reserves.

In 1953 it added another 332 miles of transmission and gathering lines and opened its second and third underground-storage operation at New York City field in Clay County and View field of Taylor County, Texas.

These two projects increased the company's underground-storage capacity by 6.54 billion cubic feet, not counting cushion gas.

Lone Star also completed two large gasoline plants—Fort Chadbourne plant near Bronte and the Springtown plant near Springtown, Tex.

L. T. Potter was elected executive vice president when the company en-

and here's why: It absorbs water instantly from gases and liquids in either a static or flowing system, is insoluble and will not swell or disintegrate in water. FLORITE gives a low dew point depression, and agressively resists "poisoning effects" which permanently destroy adsorption qualities.

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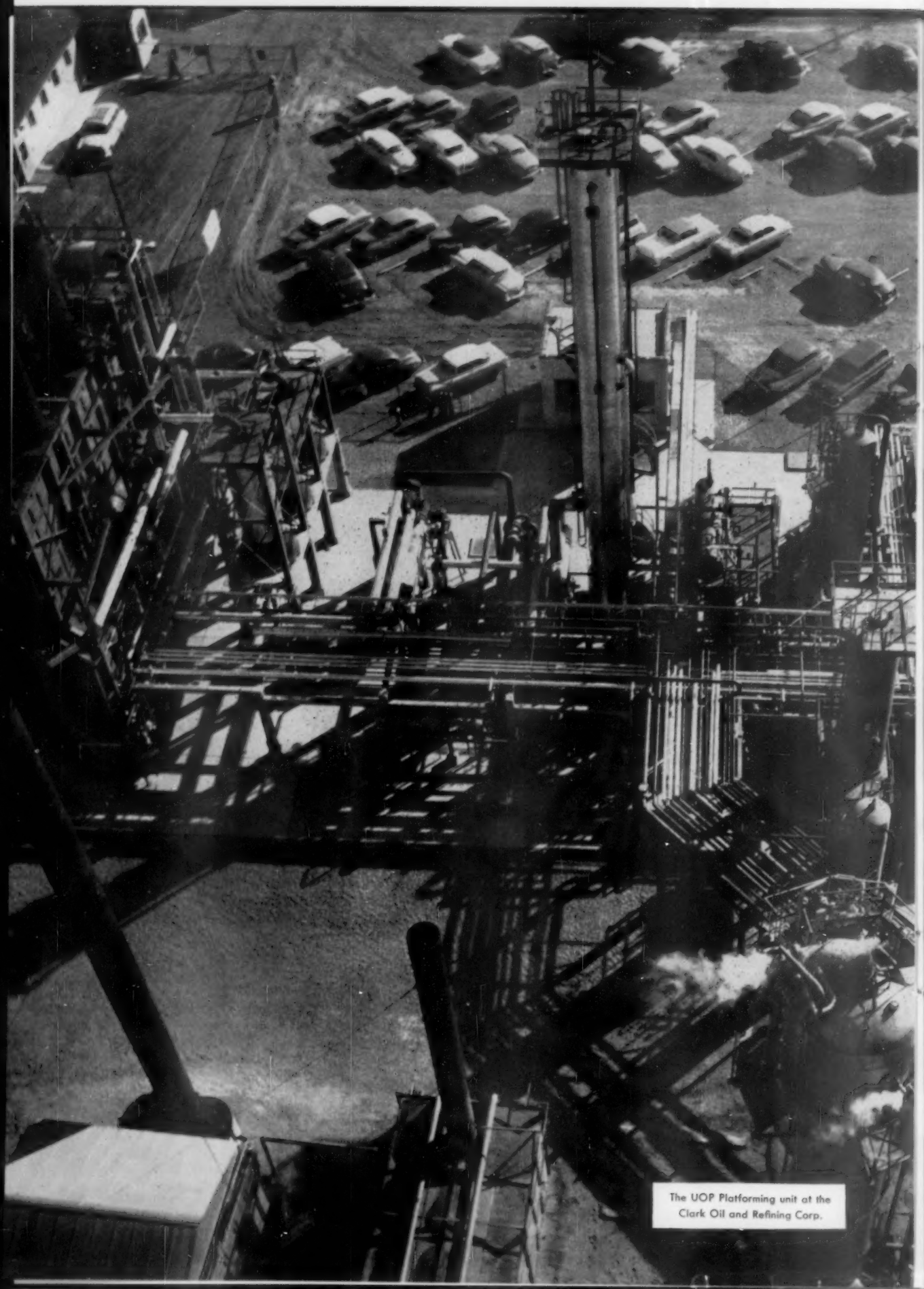

The UOP Platforming unit at the Clark Oil and Refining Corp.

Clark Oil and Refining Corporation Finds Platforming Valuable in Producing High Octanes

By John Stackner
General Manager
Clark Oil and Refining Corporation, Milwaukee, Wis.

THE UOP Platforming process, installed recently at our Blue Island, Ill., refinery, has made it possible for Clark Oil and Refining Corporation to assume a leading role in marketing high octane motor fuel in the Chicago area.

John Stackner

We are at present marketing a finished gasoline of 96 plus leaded octane, which is one of the top quality motor fuels being sold in the Chicago area. This is being sold as our new "Platinum Powered Clark Super 100 Gasoline," and it is produced in our Platformer. However, the unit will produce higher octane gasoline if needed. In fact, on test runs, the Platformer has produced 100 leaded octane motor fuel without temperatures being pushed to the design limit.

Aside from assuring us of sufficient octanes for some time to come, the Platforming process has permitted us to greatly expand our retail marketing program by making available an adequate supply of the best quality gasoline.

Closely tied in with the start up of the Platforming unit last November was the opening of 27 new, modernistic service stations in the Chicago area, marking the first time that Clark has invaded this particular gasoline marketing field. Almost simultaneously, more than 100 other retail outlets in several states, which had been flying the banner of other independent companies, were acquired by our company, and began to sell the new "Platinum Powered" gasoline for the first time in their areas. Clark now has more than 325 retail outlets in eight states—Illinois, Indiana, Michigan, Wisconsin, Minnesota, Iowa, Kansas and Missouri—an increase of approximately 100 per cent in little more than a year.

Can Produce Only Premium

The Platforming process has also given our Blue Island refinery the distinction of being one of the few in the Chicago area able to produce only premium motor fuel. We are in this enviable position because the Platformer can adequately handle the refinery's entire output of straight run gasoline without any of it being diverted to the production of less profitable materials. This of course reflects favorably on the increased profitability of the overall refinery operation.

The Platforming unit has a design capacity of 5,500 barrels per day, and it is currently operating at two-thirds of capacity in handling the crude unit's entire production of straight run gasoline. But a capacity operation can be assured by drawing upon additional supplies of straight run from the company's other refinery at Marrero, La., a suburb of New Orleans. However, an increase in the capacity of the Blue Island plant's crude topping unit from 16,000 B/SD to 20,000 B/SD will make it unnecessary to ship charge stock from Marrero for full capacity operation.

Another important advantage which has accrued to Clark through installation of the Platforming process has been the increase in the production of premium gasoline. Under our previous operation, the refinery's daily production of 93 leaded octane premium ranged from 50 to 55 per cent of the total gasoline made. With the Platformer, the production of premium has risen in excess of 90 per cent of the total gasoline output, and the octane has been increased to 96 plus.

Extensive Modernization Program

An extensive refinery modernization and expansion program was centered around installation of the Platformer, which was designed, engineered and licensed by Universal Oil Products Company. The unit was built by Procon Incorporated in about six months. We also are planning to convert one of two existing thermal reformers, which are now shut down, to a thermal cracking unit in order to supplement the yield of gasoline from a 7,500 B/SD catalytic cracking unit.

We regard Platforming as one of the greatest developments ever made in the refining field. The process has enabled Clark to become a leader in marketing top quality motor fuel in the highly competitive Chicago area. The public response to our new "Platinum Powered" Clark Super 100 gasoline has resulted in one of the biggest upswings in business in our 21-year history.

(Advertisement)

CLARK TAKES A LEADING ROLE IN MARKETING HIGH OCTANE GASOLINE WITH UOP PLATFORMER

designed, engineered and licensed by

UNIVERSAL OIL PRODUCTS COMPANY

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Laboratories: RIVERSIDE, ILLINOIS

Universal Service Protects Your Investment

larged its executive staff in January 1954.

Construction during 1954 boosted total transmission and gathering-line mileage to 7,838 miles. Lone Star expects to go over the 8,000 mark rather easily this year.

The company is working for permits for two large projects right now—either of which would push mileage past 8,000. One is a 230-mile line from Cotton County, Oklahoma, to Fritch in the Texas Panhandle. The other is a 205-mile project from Snyder, Tex., to a connection with the first line about 60 miles east of Fritch.

Lone Star currently has surplus gas on its hands. With these two lines it hopes to dispose of this at the Panhandle location to Natural Gas Pipeline Co. of America (or others in the Fritch area) which contrarily is excruciatingly short of gas for its Chicago market area

From a firm with no gas and repeated threats of receivership proceedings, Lone Star has come a long way in the past 30 years.

Lone Star as of 1955

The company has progressed, for instance, from a small group of men with an idea to a far-flung system employing almost 6,000 persons.

These are employed in three major divisions—the transmission division under Vice President Julian L. Foster; the exploration and gas supply division (Lone Star Producing Co.) under Vice President E. A. Brown; and the three distribution divisions under Senior Vice President Chester L. May.

Foster is assisted in administering the transmission division by J. M. Kindle, superintendent of operations.

The transmission division is composed of nine departments: Pipeline, engineering, compressor, dispatching, electrical, gasoline, gasoline sales, gas measurement, and right-of-way and claims.

Pipeline department . . . Construction, operation, and maintenance of the company's nearly 8,000 miles of transmission and gathering lines are handled by the pipeline department under Superintendent Luther Tolbert and Assistant Superintendent J. N. Carpenter, in Dallas. The pipeline department is divided into 14 operating-maintenance districts.

Under Tolbert are 14 superintendents, 36 assistant superintendents, and 50 supervisors located in strategic spots throughout the system. The department is one of the division's largest, comprising more than 650 employes.

Lone Star, except for a short time during the second World War, when labor was extremely scarce, has done all of its pipe laying. The company maintains two construction spreads. These vary in size from 25 to 200 men, depending upon the size of the job. On the bigger jobs most of the help is picked up locally and is temporary.

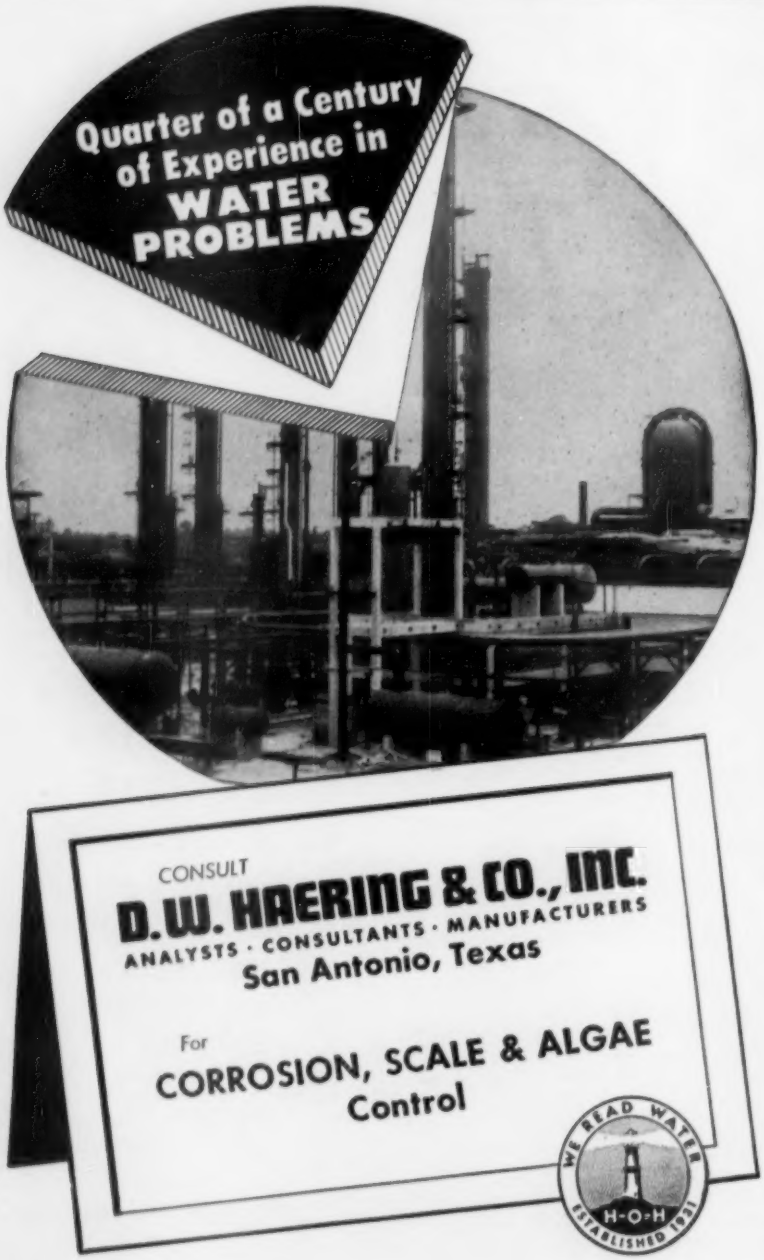
The spreads are equipped with everything needed to lay lines up to 20 in. in diameter, whether in forest, swamp, or mountains.

Engineering department . . . The engineering department, under Chief Engineer R. A. Minter, is composed of seven sections which handle a wide variety of assignments.

These are the drafting, plant design and control, general engineering, system planning, surveys and inventory, construction, and records and reports groups.

The drafting section produces maps, plats, drawings, etc., for company operations ranging from lease acquisition to construction of compressor stations, gasoline plants, and all types of auxiliary structures.

The plant design and control section consists of three groups. A design group designs the plants, requisitions materials, coordinates construction, etc. The laboratory group primarily handles



analyses of hydrocarbon, water, and treating solutions. A cathodic-protection group has the responsibility of checking corrosion on the system.

The general engineering section prepares data for FPC applications, prepares estimates for expenditure requisitions, and performs other miscellaneous tasks.

A system-planning section has the responsibility of preparing reports for the division which will enable it to have the right volume of gas available at the right time at the right place. It analyzes operating data, estimates consumer demand, calculates desired pressures and volumes at key points on the system, and recommends needed additional facilities in these reports.

It also designs transmission and gathering lines and sets up pipeline specifications, correlates weather information for use of dispatching department, and performs varied other duties.

The surveys and inventory section makes preliminary, location or topographic surveys for pipelines, plant sites, and leases; runs elevations; calculates closures; writes land descriptions; and makes inventory sketches or photographs of lines and plants.

The construction section builds compressor stations and dehydration plants. The section is directed by a construction engineer who assists in design and procurement on major projects, expedites delivery of plans and materials to the field, locates and supplies qualified personnel, etc.

The records and reports section keeps records of pipe and expenditures; requests right-of-way for pipelines, permits for crossings, and sites for plants and other buildings.

To accomplish all this, the engineering department has, in addition to Minter, an assistant chief engineer, 10 engineers, 6 junior engineers, a construction engineer, chief and assistant chief draftsman, 3 draftsman supervisors, 6 senior draftsmen, 8 draftsmen, 6 apprentice draftsmen, a blueprinter, a general clerk, a junior clerk, a design engineer, a research engineer, a chief chemist, and 3 junior chemists.

Compressor department . . . Functions of Lone Star's compressor department are to operate and maintain the company's 35 stations so as to: (1) boost gas pressure at vital points on the system, (2) compress gas taken from low-pressure fields and deliver it at higher pressure into transmission lines, and (3) compress gas from the pipelines for injection into underground - storeage reservoirs.

The department also, however, maintains and operates several dehydration plants, a desulfurization plant, and a gas-stabilization plant. All of these are located on the premises of compressor stations.

The department, directed by T. J. Skrabanek, has a superintendent at each station. Larger stations have up to eight other employes, the smaller ones from one to four men.

In the case of the large plants, an operator and helper are on duty at all times. Each crew works an 8-hour tour.

Dispatching department . . . This department is headed by H. L. King, chief dispatcher. He is assisted by an assistant chief dispatcher and six dispatchers.

The department keeps a 24-hour check on at least 30 key pressure points over the system, schedules timing of pipeline repair jobs when there is a possibility of service interruptions, reroutes gas during repairs, issues curtailment orders to distribution divisions when necessary to protect domestic consumers due to peak demands or emergency repairs, takes gas ratably (in cooperation with production department) from all sources so far as possible, and performs many other functions.

Not long after the first pipeline from Petrolia to Fort Worth was laid, the company found a private telephone

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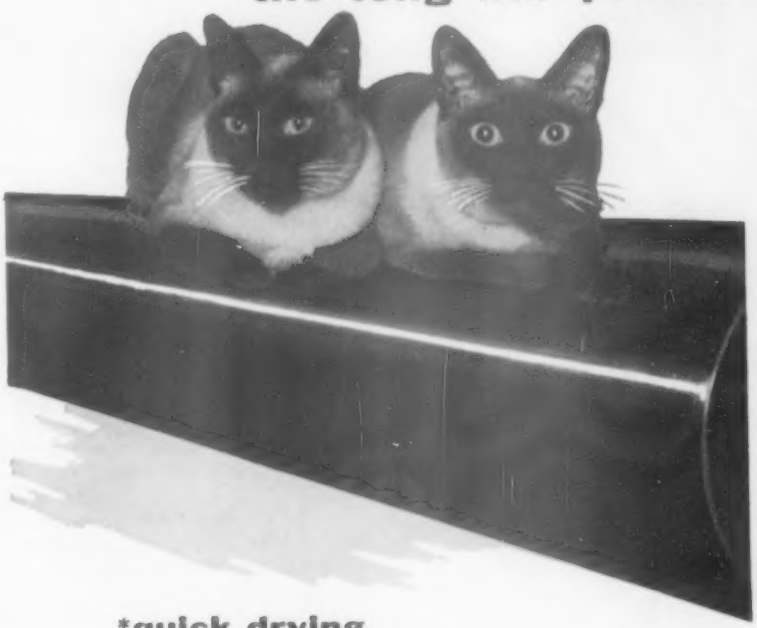

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Reilly Q. D. Primer has 9 lives in the sense that it is a 'hard-to-die' primer. Using this 'alive' primer will save endless costs in replacing 'dead' primer.

In every instance Reilly Q. D. Primer is good for 72 hours or more and our technical service men say some Reilly Q. D. has been found 'living' as long as 12 days after application.

P. S. We like to furnish a ton of Reilly Intermediate or Pipe Line Enamel with each 3 to 4 gallons of Reilly Q. D. Primer supplied.

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system essential to facilitate handling of reports on gas pressures, volumes, weather, etc.

Lone Star, of necessity, built its own telephone system. It has expanded steadily until at last count it consisted of 1,137 circuit miles (or 858 pole-line miles). Dispatching of gas is handled over these lines the year around.

In addition, telemeter circuits are superimposed on the regular telephone circuits. Telemeters are used to record line pressures and enable company personnel to determine pressures at unattended as well as attended stations.

Telemeter controllers enable a central-office employe to raise or lower pipeline pressure at an outlying point on the system. By flicking a toggle switch which actuates a cam on a regulator, line pressure can be raised or lowered at a rate of 5 psi. per minute, after a 1-minute lag for the cam to begin operating.

Bell alarms installed over the system are actuated automatically when pressures drop too low or climb too high. If too high, the bells ring continuously, if too low, intermittently.

Together with these communication facilities, Lone Star has made substantial use of radio since 1950. At mid-April, it operated 33 base stations (26 operated by transmission division) and 2 portable stations with 10 more portable stations already licensed.

The company has more than 250 mobile units. It will build seven more base stations this year—all for transmission division.

Six of the base stations are 250-watt installations. These, all transmission stations, are located at Cayuga, Abilene, Ballinger, Sonora, Dallas and Ranger. All other stations are 60-watt units.

Electrical department . . . The electrical department is headed by C. O. Diller, superintendent. He is responsible for design, specifications, and installation of all electrical equipment

By this time Lone Sar was taking over the system. He also is responsible for satisfactory initial performance of this equipment, which ranges from that on pumping leases and in plants and stations to that at cottages and to cathodic-protection installations.

The department must maintain the company's private communication system. Permanent telephone-repair and installation crews are stationed at Irving, Bowie, Gainesville, Vernon, Gordon, Joshua, Tex., and Hollis, Okla. A division lineman is in charge of each one to three-man crew.

An electrical foreman and an assistant cover the entire electrical system to make inspections and repairs.

Gasoline department . . . This department designs, builds, and operates the organization's gasoline plants. Lone Star Gas owns five of these, Lone Star Producing the remaining eight.

There are 460 employes in the department, headed by C. R. Rogers as superintendent of gasoline plants. Under Rogers are a superintendent and an assistant at each plant. There are 20 to 60 employes at each plant.

The department handles all matters of administration of the plants as well as of operation. It also is responsible for the operation and supervision of the 27 dehydration and desulfurization plants on the company system.

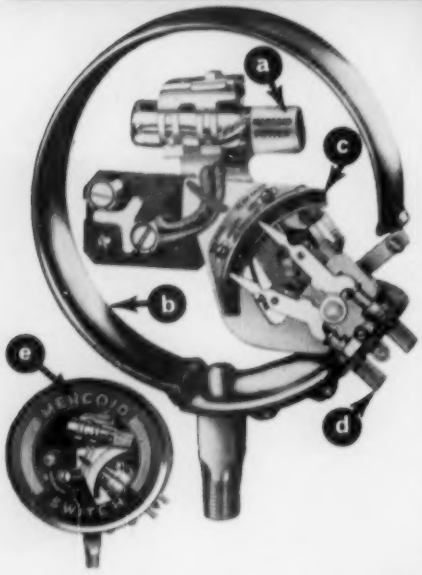
A structure maintenance group within the department maintains all company cottages and field offices, and keeps painted plant and pipeline bridges of the transmission division.

Gasoline sales department . . . This department is directed by Paul Bagley, sales manager.

The department sells all liquid products except crude oil, advises plants regarding products to be manufactured and shipped, and places shipping instructions.

Gas-measurement department . . . This

Will the controls you specify provide safe, dependable operation today, tomorrow or a year from now?



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No guesswork or calculations are required—the pointers indicate on an accurately calibrated dial, the exact operating pressures or temperature.

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You can tell at a glance whether switch circuit is on or off.

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BUY McNAMAR-JOY GAS COMPRESSOR UNITS

for increased... VERSATILITY COMPACTNESS PORTABILITY

The unit pictured above was purchased to boost gas on a lease in Texas. Important to the customer was versatility, compactness and portability. Cost was of the upmost importance — so — a McNamar-Joy packaged Compressor was purchased . . . Look at these outstanding features . . .

FLEXIBLE . . . The four cylinder, two stage unit shown above can be converted in the field in a matter of hours to a single, three or four stage unit.

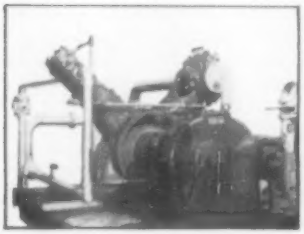
COMPACT AND COMPLETE . . . The McNamar-Joy unit, complete with the modern rugged Joy compressor, gear reducer or beltdrive, engine, cooling system and other controls mounted on a single structural steel skid.

PORTABLE . . . Because of its greater compactness and single skid mounting, the McNamar-Joy unit is extremely portable and can be moved on a tandem semi-trailer without disassembling.

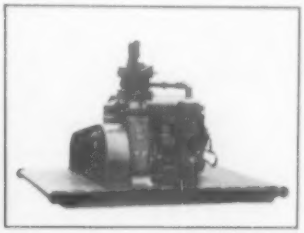
ACCESSIBLE . . . Foremost in our assembly design, is the arrangement of the equipment to allow ease of access to all parts that may require service or maintenance.

LOW IN COST . . . The McNamar-Joy gas compressor unit is truly a complete package and because of its versatility, compactness and portability *it will remain a package. To you* this means greater savings in installation, maintenance and in changing applications and locations. Units are available on purchase, rental, and purchase-rental option basis . . .

Telephone, wire or write today and let us demonstrate how the McNamar-Joy unit can save you money . . .



Heavy duty "V" vertical twin cylinder for single or 2 stage application to 200 H.P.



Single cylinder, double acting, application to 100 H.P.

McNAMAR BOILER AND TANK COMPANY

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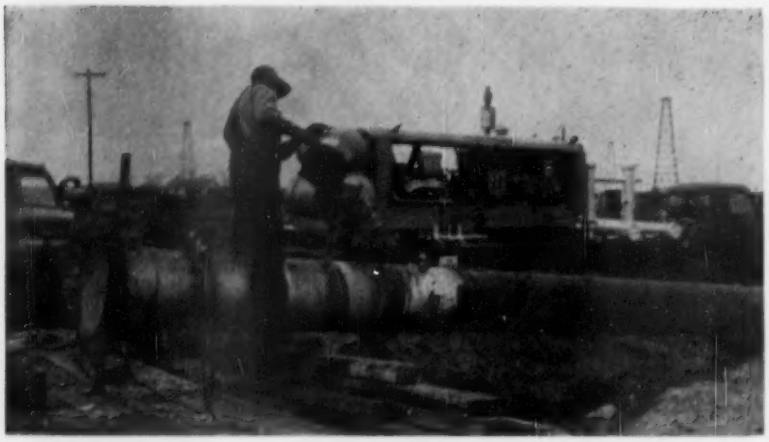

pipelines with normal service life no longer than 18 months now in trouble-free service since 1948*

Crude oil pipelines in such highly-corrosive fields as Goldsmith (Ector County, Texas) and the Fuhrman-Mascho (Andrews County, Texas) often have a life expectancy no longer than 18 months. Lines cleaned and coated by the Pipelife method in 1948 are still giving leak-free service today.*

The key to this prolonged service life is a smooth, unbroken, corrosion-resistant coating *inside the line.* Applied by techniques developed under the name "Pipelife," this coating is impervious to scale and corrosion. It presents no exposed areas —however small—where corrosion may "take seed" and begin to spread.

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An IPM field engineer will be happy to call on you at your convenience to explain the process, and—without obligation—make estimates and quotations on your work.

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*See 5th Biennial Permian Basin Corrosion Tour Report, NACE.

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the company with the longest continuous service experience in its field—Pipelife's only licensed operator in Texas.

department, headed by Superintendent E. E. Stovall, is charged with measuring the flow of gas from wells and plants through gathering and transmission lines, and into city and town distributing systems.

Stovall's staff consists of a field superintendent of measurement, regulation, and inspection; a field supervisor of measurement, regulation, and inspection; and a foreman and assistant foreman of meter and regulator shop; an office measurement superintendent and a supervisor; 6 measurment engineers, and 28 clerks and stenographers.

Right-of-way and claims department . . . Under Gerdes W. Rice, superintendent, this department obtains right-of-way and settles claims as its name implies—not only for transmission, distribution, gathering, and well lines but for telephone and telegraph lines as well.

It also negotiates for sites for all types of company buildings and plants.

There are 18 employes in the department—10 of them in Dallas, the others (all right-of-way agents) located at key points throughout the company system.

Exploration and Gas Supply Division

E. A. Brown, vice president of the division, is assisted in directing its operations by Carl M. Hill, superintendent of operations. The division is responsible for finding, producing, and buying the gas which Lone Star requires.

Principal departments are the gas-supply department under J. Paul Rogers, the geological department under F. E. Kendrick, the production department under M. O. Attebery, and the land department under J. L. Toone.

Rogers is assisted by an assistant manager, two gas-supply engineers, and clerical help.

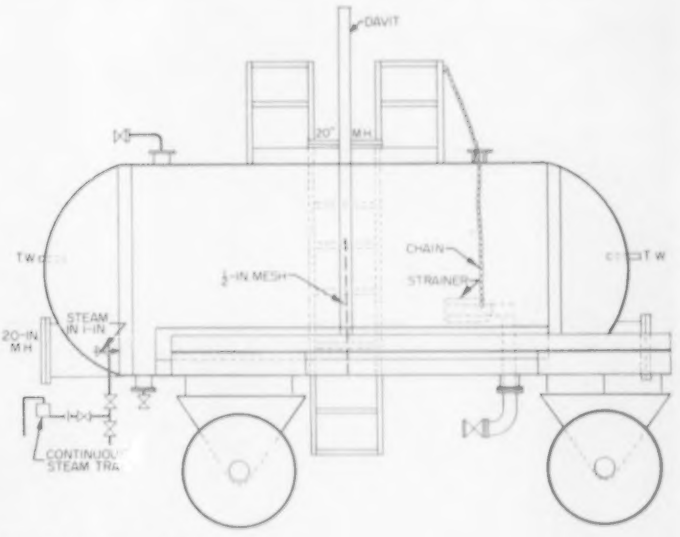
The geological department operates the same as that of any oil company. Chief Geologist Kendrick is assisted by an assistant chief geologist, a division geologist, six staff geologists, and clerical help.

Production Superintendent Attebery directs the activities of a field supervisor, a chief production engineer, five production engineers, and clerical help.

Toone has a superintendent of lease records, superintendent of contract records, superintendent of leasing, and a district lease agent who supervises six staff lease agents.

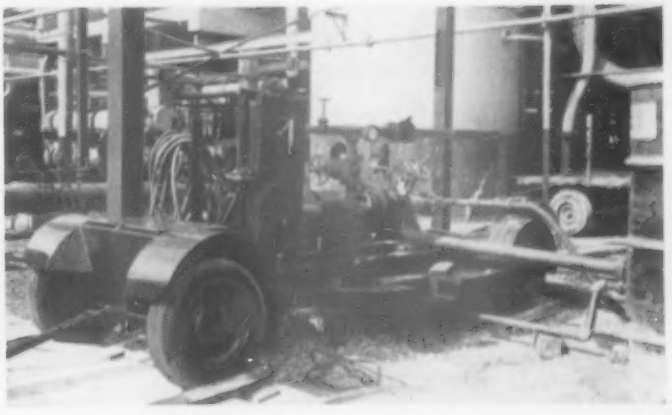
The exploration and gas-supply division last year drilled 66 wells. This figure was second only to 1950 when the company completed 86.

Of the 66 completed last year, 39 were oil wells, 13 gassers, and only 14 were dusters. Nine of the successful wells were discoveries. That's doing pretty good in anybody's league.



Tank trailers, used separately, or combined for flexibility . . .

. . . converted tank cars



. . . and portable pumps—reasons why

This Cleaning Program Really Cleans

TEXAS TODAY

by F. Lawrence Resen
Gulf Coast District Editor

THE chemical cleaning program at Gulf Oil Corp.'s Port Arthur, Tex., refinery includes a mobile railroad tank car, two mobile trailers, a 2,500-gal. vat, several portable pumps, a knockout drum, and other pieces of auxiliary equipment.

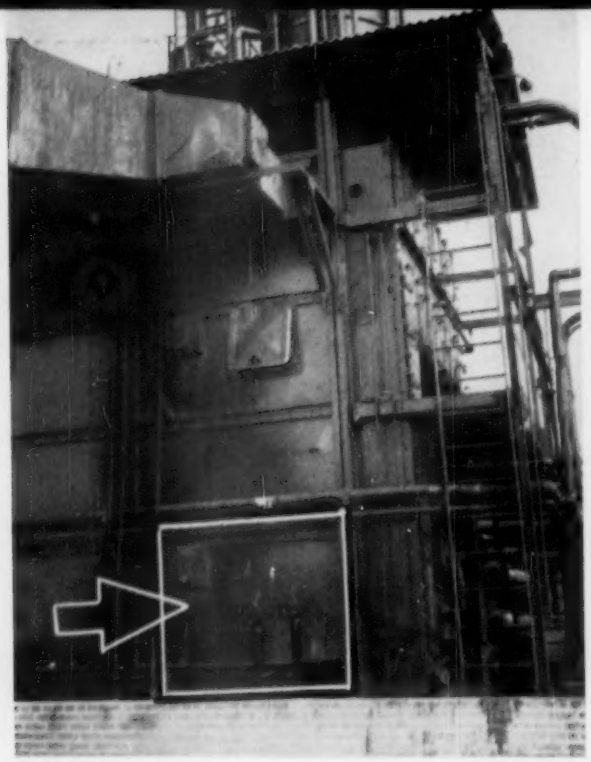
Permanent piping installations have been made on several units to facilitate cleaning operations. A permanent vat has been installed in Gulf's adjacent ethylene plant for circulating cleaning solution through a battery of condensers while in place. Portable equipment may be either immersed in vats or spray-cleaned as desired.

Growth of the program is testimonial to its effectiveness in cleaning a wide range of equipment with a minimum of down time and a high degree of efficiency.

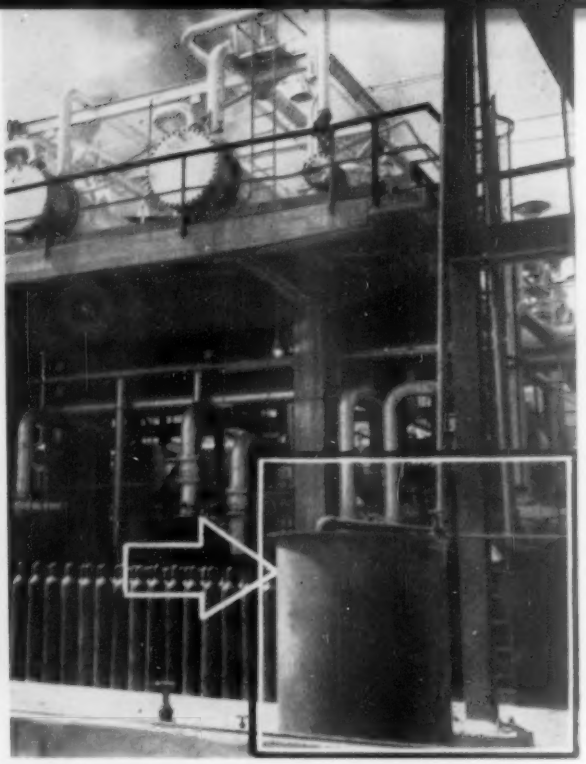
Organizational . . . The cleaning program is supervised by a foreman, working with the pipe department, and master mechanic in all areas of the refinery. Under this arrangement it is possible to coordinate closely the activities of all departments and schedule the equipment as required with a minimum of conflicts.

Planning is essential to the effective operation of the program in holding down time to a minimum by providing a clean, gas-free tower for maintenance crews to work on at their convenience. While on the surface it may appear that the spotting of equipment near the desired unit is the most complicated piece of planning to be encountered, it just isn't so. Due to the wide variety of towers to be cleaned, the differences being in material processed as well as physical size, internals, etc., much preliminary work is involved in planning a cleaning operation.

Initially a study is first made of the type of deposits which are expected to be encountered within the unit, say a tower, being cleaned. It may be predominantly an oil deposit rather than carbon, it may be just the reverse, or it may be primarily sulfides and iron oxides. In order to determine best



PERMANENT TIE-INS have been installed at this naphtha rerun still. The lines extend beneath furnace to tower and it is only necessary to back trailer up to furnace to make connections.



PERMANENT VATS, such as the one arrowed, are installed at the ethylene plant. Condensers are cleaned in place by moving in a pump and circulating solution from vat through condenser battery.

which type of cleaning agent should be used in a particular tower, tests are made using samples from the tower or one in similar service.

The zone superintendent and operating foreman are also contacted to obtain information on the function of the tower, the process involved, and limitations, if any. Where feasible, drawings are obtained and studied to determine size and makeup of the tower, including size and type of trays, internal parts, etc. The operating foreman is consulted as to the best means of establishing circulation between the tower and solution vat (or mobile trailer-tank car) and the provisions for steam or air injection into the tower.

The next step, and one which is progressively being eliminated by the installation of permanent tie-ins, is to provide for tying the solution circulatory system in with the tower. This normally means a connection to the reflux line over the top of the tower for charging the unit with solution, and discharging into the solution vat through a bottoms connection on tower.

Equipment . . . A decided advantage of Gulf's chemical cleaning program is the number and variety of mobile pieces of equipment at its disposal. As noted earlier this includes the following:

1. **Railroad tank car:** This was removed from regular service and modified to include steam coils for heating the solution, two duplex steam pumps for pumping the solution into the tower, baffles for retaining solids removed while circulating through the tower, and a permanently installed davit for lifting drums of chemicals when charging the tank car. The tank car has a capacity of 8,000 gal. of solution.

Gulf's practice is to charge the car with chemicals and water, agitate with air for proper mixing, and then move to the location and heat by steam injection so that the solution is ready to charge into the tower when needed. The car is also used for cleaning other tank cars for such exacting service as carrying alcohols. In these cases the chemical car and the car to be cleaned are connected together by appropriate piping and the solution circulated between the two cars until the interior surface is cleaned.

The railroad tank car has a distinct advantage in being a complete unit with built-in pumps and racks for transporting necessary pipe joints and fittings. However, it has the natural disadvantage of not being accessible to all parts of the plant; it cannot be used where it ties up main-line plant trackage, and it can be moved only by means of a locomotive. Its movements have to be fitted in with the over-all plant rail schedule and it requires a separate siding, which is tied up as long as the cleaning cycle continues on a particular unit.

2. **Mobile trailers:** To offset the disadvantages of the railroad tank car and to provide even greater versatility and flexibility, two mobile trailers were specially constructed. These each have 2,500-gal. capacity and are so fitted that they may be used singly or together. The tanks have necessary steam coils and baffles built in and have an overhead davit for handling drums. However, the trailers are not equipped with pumps, as on the tank car, and it is necessary to transport a portable pump to unit location in each instance.

Each trailer is equipped with heavy-duty dual wheels on three axles to spread the load over a wide base so as to avoid heavy load concentrations on refinery roads. The trailers may be moved conveniently throughout the plant by any means of motive power and can be easily spotted in practically every unit wthin the refinery.

3. **Portable vats:** Prior to acquisition of mobile equipment, the portable vat was used extensively throughout the plant. The metallic vat is equipped with proper fittings and the necessary baffle arrangement, and is easily moved with the use of a straddle carrier. Several vats are still used throughout the plant, the largest having a 2,500-gal. capacity.

When mobile units are tied up or when it is difficult to use them due to confined working space, overhead lines, and structural arrangements, the portable vat is still being used. It requires a pump to be moved in, as in the case of the trailers. Vats are also used quite

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extensively in soaking tube bundles from heat exchangers and condensers. Solutions are heated by connecting a steam line to the vat and letting the live steam heat the contents.

4. **Permanent installations:** A gradual trend is in effect in the installation of permanent fixtures to facilitate chemical cleaning operations. The simplest of these is the use of permanent tie-ins for connecting suction and discharge lines from the mobile equipment. For instance, at a lube-oil rerun still, a 3-in. line runs from a spot near the heater to the top of the distillation column. A second, 4-in. line, parallels the 3-in., and runs to the bottom of the column.

When the column is to be cleaned, it is only necessary to spot the mobile equipment alongside the heater—the most convenient location—connect the pump discharge to the 3-in. line and connect the 4-in. line to the tank or vat, as the case may be. The lines are opened into the top and bottom of the tower, respectively, and circulation can be begun at once. This eliminates the need for portable piping and temporary connections.

At the ethylene plant, the permanent installations include a solution tank. The installation is adjacent to a condenser battery through which solution is circulated at desired intervals. The only piece of equipment which has to be moved in is a pump. This is set up alongside the vat, from which it takes suction, and discharges into a permanent line which carries the solution to the condenser battery, from where the solution is turned into the individual condenser being cleaned.

A second line carries the solution back to the vat. A steam line is located so that steam may be turned into the vat to heat the solution. A water line is also available.

These permanent installations make it possible to move in on short notice and complete the job rapidly to lessen down time.

Procedures

Techniques adopted through experience are interesting in showing the best methods to follow in cleaning various pieces of equipment, such as towers and heat exchangers. These will be discussed in more detail. However, it is best to note that individual conditions will naturally vary according to type of service, length of runs prior to chemical cleaning, and types of deposits.

Towers . . . Attention has already been given to the need for planning individual tower schedules. The analysis of deposits, and a review of the unit's operations with the operating foreman are an essential preliminary. Once these details are completed and the decision made as to which solution is best, the equipment can be moved in and connected to the tower. Steam should be turned in the vat to heat the solution to the desired temperature. Startup awaits the approval of the operating foreman who completes preliminary steaming to recover all feed stock possible. A vent must be then provided on the tower.

Once this has been done, the solution is pumped into the tower through overhead connections (reflux line). When sufficient volume of cleaning solution has been pumped into the tower so that circulation can be maintained, suction is taken near the bottom of the tower. Solution is moved through the tank (vat) to settle out heavy deposits and then circulated back into the tower overhead.

Steam is added from the bottom of the tower to heat the solution to 180°-200° F. and to give a turbulence to the solution as it passes through the tower. This agitation aids in cleaning the bottoms of trays, caps, packing, and walls of the tower. Line sizes entering and leaving the tower are quite important so that a real flooding action over the trays may be maintained.

Once the flow is leveled out so that the circulating pump maintains an even rate of flow, it is desirable to pick up the rate from time to time as the tower

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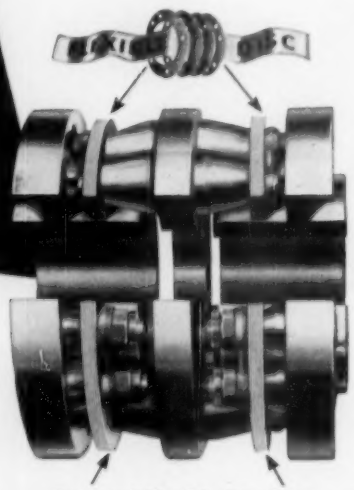

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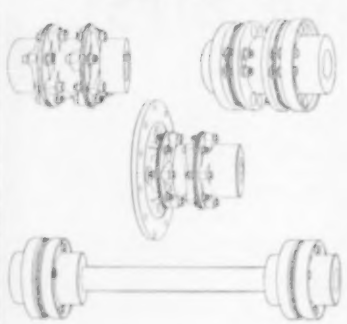

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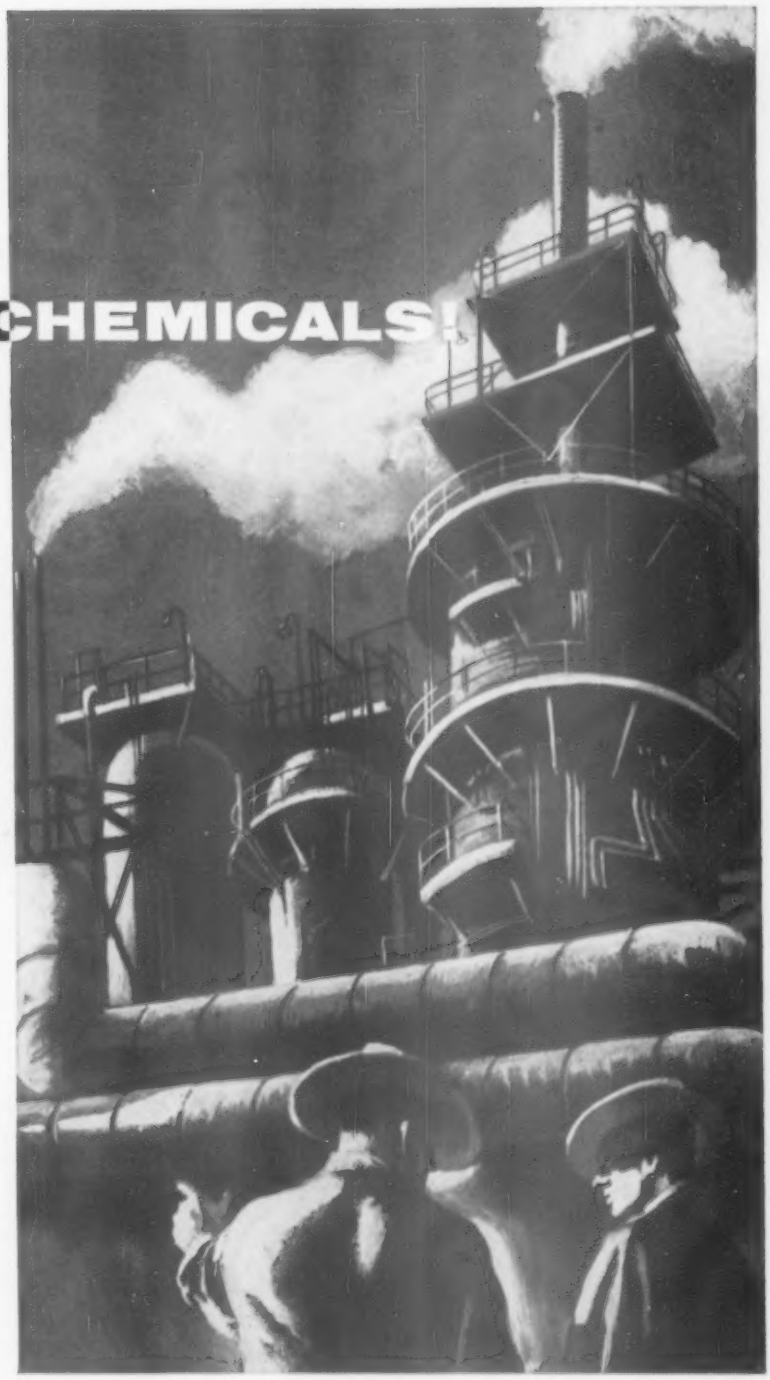

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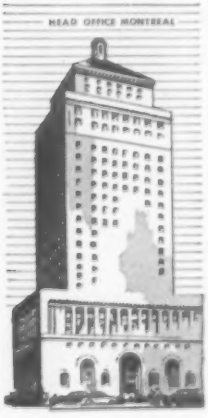
The Royal Bank's Oil & Gas Department in Calgary issues current Bulletins covering statistics, regulations, tariffs, oil and gas financing, and kindred subjects. These are available on request. For a list of bulletins, write to The Royal Bank of Canada, Oil & Gas Department, 108—8th Avenue, Calgary, Alta.



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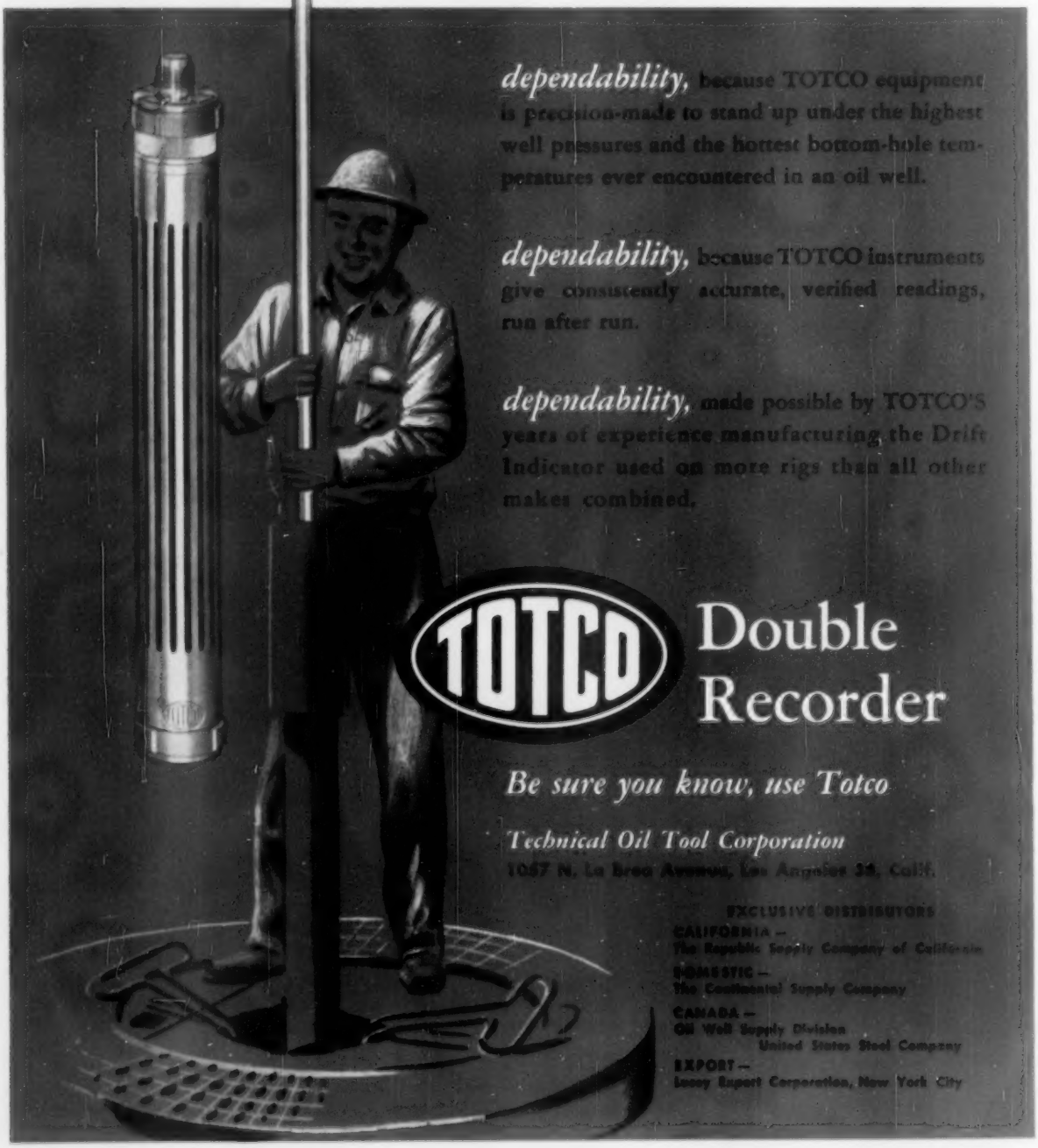

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cleans out. The strength of the solution is checked by frequent titrations and cleaning agent is added to bring it up to the desired strength. The temperature is maintained within the desired range, and is varied within this range to take advantage of pump characteristics which will be more effective at a particular temperature. The temperature range is much lower for iron oxide, calcium, or magnesium scales. These can be cleaned most effectively between atmospheric temperature and 130° F.

Experience has shown that a thorough cleaning job can generally be performed with 8-12 hours cleaning and 4-6 hours rinsing time. During the cleaning cycle, a hard steaming for 30 minutes, repeated three or four times, is found to be very effective. Maximum amount of steam used during the tower's operations can be used as a guide in turning in steam during cleaning. Steam is normally turned in from the bottom of the tower to provide turbulence throughout the tower. This significantly improves the cleaning job.

Once the cleaning cycle is repeated, the solution is recovered in the tank car (vat) and saved for a later job, or may be used on another tower in the unit during the same shutdown. Water is pumped to the tower overhead for rinsing the tower. During the rinsing cycle, water is pumped through at as high a rate as possible and steam is added to the bottom of the tower intermittently for 30 minutes at a time. In both cleaning and rinsing cycles, turbulence is quite important. If enough steam is not available, it is sometimes possible to use air as a substitute.

Heat exchangers . . . Much of the heat-exchanger cleaning is still being done by sandblasting, rodding, and sawing. However, chemical cleaning is also being used and three general methods are followed:

1. **In place:** A chemical solution is circulated through the tube and/or shell side of the bundle without removing it from the shell. From 2-3 hours is generally needed for cleaning followed by an agitated rinse. Air or steam turbulence is highly desirable. Generally an exchanger or bank of exchangers is filled from the low side, with the return to the vat taken from the high side. This insures a wet tube all the way during the cleaning cycle.

2. **Soak tank method:** If a unit has spare bundles or it is desirable to pull a bundle for inspection, it is practical to have a straddle carrier move in a vat in which the bundle can be immersed in the proper solution. When the bundle is completely immersed, open steam or air can be injected in the vat to give turbulence to aid in the cleaning. In most cases heat will be desirable, but in some instances bundles are cleaned in a cold solution.

3. **Steam detergent method:** Some bundles are too large for cleaning in the vat available. In these cases, a cleaning solution is applied with a hand sprayer or a mobile tank. This unit holds 55 gal., has an electric-driven pump capable of pumping at 55 psi., 50 ft. of hose, and a spray nozzle. After first spraying on the solution and allowing it to soak for a short while, the solution is again sprayed on and the surfaces thoroughly steamed.

4. **Rotating vat:** Another method which is not available, but which is due to be constructed, involves a rotating vat. The bundle will be placed in this vat and gradually rotated. Cleaning solution will be sprayed through high-pressure nozzles onto the bundle.

Gulf uses Oakite solutions for cleaning purposes.

Acknowledgments

Cooperation of the management of Gulf Oil Corp. in the release of this information and the assistance of H. D. Anthis, Port Arthur, in assembling this material is hereby gratefully acknowledged.

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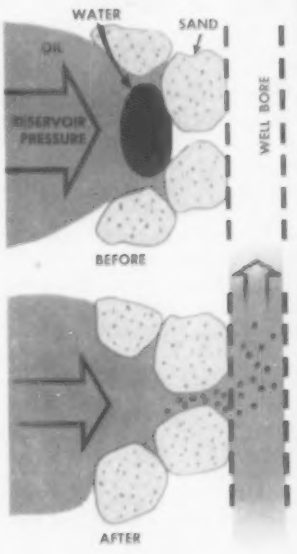

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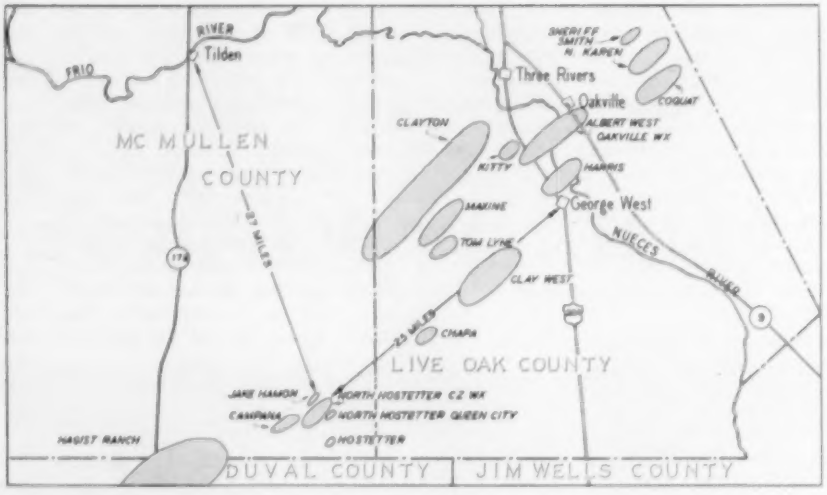

Fig. 1.

Case History—Three McMullen County Fields

by Jay R. Endicott

FIRST emphasis on southeastern McMullen County was caused by the discovery of Campana and South Campana fields around 1940. Oil production from these fields and others in trend was found in the shallow Jackson-Yegua series at a total depth of about 3,000 ft. No thought was given to the deeper possibilities until 1944 and 1945 when the Carrizo-Wilcox sand discoveries of Goliad, Karnes, Bee, and Live Oak counties were proving good reserves. A try was made to extend Carrizo-Wilcox production into the southeast corner of McMullen County in late 1944 and early 1945 by Humble Oil & Refining Co. in its 1 and 2 Baker. But neither of these wells was productive.

Initial successes . . . The increased activity in the Carrizo-Wilcox trend by Sunray Oil Corp. in Goliad, Karnes, and Bee counties was at this time meeting with favorable results. This, coupled with the fact Sunray already had holdings in the Campana field area and that the Humble wells showed good sand conditions, started this company on a seismic program in southeastern McMullen County. The results led to leasing and eventually to drilling the discovery well of Hostetter field.

Discoveries . . . In July 1951 Sunray completed its 1 A. M. Hostetter in the lower Wilcox section for 6,000 M.c.f. of gas per day through perforations at 10,088-10,114 ft. This is the discovery well for Hostetter field.

The Sunray 1 Yeager was spudded on October 27, 1951, on a 320-acre tract earned by contribution from Humble by the drilling of the 1 Hostetter. The upper Carrizo-Wilcox sand was cored and an open-hole test was taken over an interval of 8,300 to 8,406 ft. In 18 minutes the well developed 3,925 psi. surface pressure and unloaded most of the water cushion. Recovery was only 90 ft. of gas-cut mud and 60 ft. of water cushion, but this test was definite proof of the productivity of the upper Carrizo-Wilcox sand in Hostetter field.

Percussion sidewall cores of sand in the section had a slight gas odor. Five and one-half inch liner was run and perforated from 10,266-88 ft. The completion from this sand constituted a new discovery with a potential of 6,400 M.c.f. of gas per day open flow, gas-oil ratio 23,400 to 1, gravity 53.7° A.P.I., shut-in tubing pressure 6,200 psi.

Later drilling uncovered Jake Hamon and North Hostetter fields.

Midstates Oil Corp. completed its 1 Berger Unit in February 1954, in the Queen City sand section from 6,061-74 ft. flowing 4,800 M.c.f. of gas per day open flow plus 30 bbl. of distillate per million cubic feet of gas of 51.4° A.P.I. gravity, shut-in tubing pressure 2,365 psi. This was the discovery well for North Hostetter (Queen City) field and the first Queen City production in this portion of McMullen County.

Structure and Nature of Trap

Pettus . . . The primary expression of structure in Hostetter field and the associated area is a domelike feature which is divided into segments by faulting. On the Pettus sand at the top of the Yegua formation, a structurally high area is isolated in Sections 61, 62, 101, and 103. On this high is located Campana field which produces from the Government Wells sand of Jackson age and the Pettus sand.

From this structurally highest area, nosing extends toward the northeast and southeast to include the Hostetter-North Hostetter field areas. The faulting at the Pettus horizon consists of one fault of some 300 ft. of throw and two smaller faults, all of which trend in a northeast-southwest direction.

On the nosing in the vicinity of Jake Hamon field, Pettus mapping shows small closures along the 50-ft. to 90-ft. fault, both on the up and downthrown sides where there are some small gas reserves with low pressures in the Argo sand and in the Government Wells sand.

The Government Wells sand is a blanket sand in this area with over 100 ft. of thickness. Accumulation in the Government Wells is primarily in the top in this area. When contoured at 10-ft. intervals, a small closure appears just south of Sunray et al 1 Stella Penna in the North Hostetter field area. No indication of individual structure or accumulation has been found in Hostetter field in the section from the top of the Jackson, found at about 1,850 ft.,

The author is district geologist for Cosden Petroleum Corp.

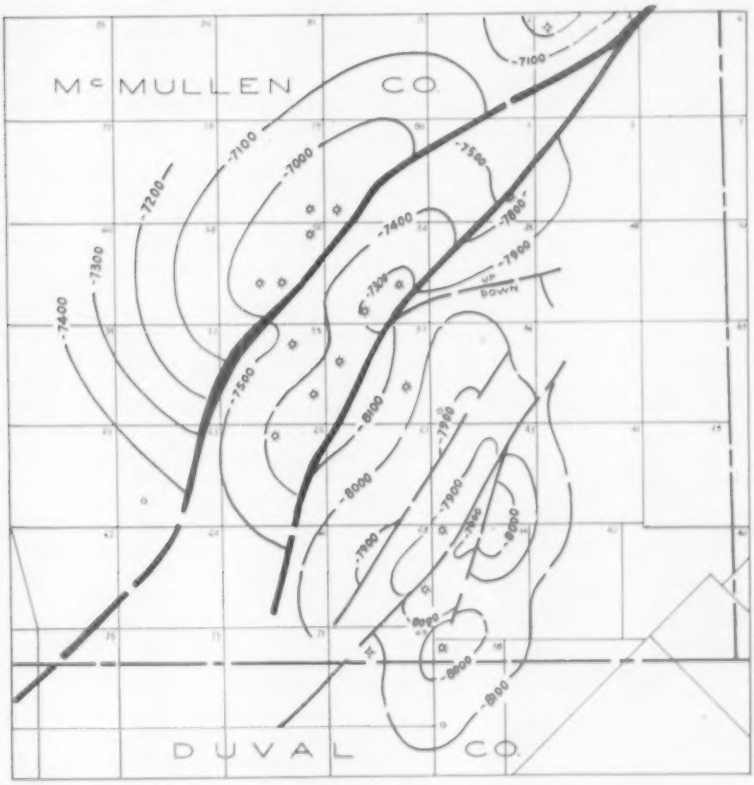

Fig. 2—Structural map contoured on top of the Carrizo-Wilcox shows a complexly faulted anticline.

Fig. 3—Electric-log cross-section shows the principal pay zones and the faulting.

to the top of the Yegua at 3,150 ft.

Deeper horizons . . . The Queen City structural map closely resembles that of the top of the Carrizo-Wilcox although they are separated by an interval of some 2,300 ft. At Queen City level, the fault pattern has become distinct and is more definite as a controlling factor on accumulation.

Carrizo-Wilcox level . . . Fig. 2 shows the structure on the top of the Carrizo-Wilcox sand section, the main producing zone in North Hostetter field. At this level, the highest portion of the individual structures lies close to the upthrown side of each of the major faults and dips off into the downthrown side of the next fault updip. The dip into the down-thrown side of these faults was experienced first in the Sunray et al 1 Renshaw Unit where extreme thickening was encountered in the Reklaw shale section just above the top of the Carrizo-Wilcox. This apparent thickening might be due to cutting the beds at an angle as they roll over into the fault rather than an increase in true thickness of sediments.

The Sunray et al 1 Penn-Argo Unit, located in the northeast quarter of Survey 55, is a very low well in North Hostetter field due to the structure dipping into the Jake Hamon field fault. No thickening of section was found in this well which might indicate there is no banding of the beds into the downside of the fault.

Faulting

There are three separate faults or fault systems in the Hostetter-North Hostetter field areas, all of which are down to the coast and trend northeast-southwest. These faults have been numbered on Fig. 2.

- Fault No. 1 is the controlling fault for Jake Hamon field where it cuts the field wells near the Queen City level. The throw of this fault is from 300 to 350 ft. at approximately —5,500 ft.

- Fault No. 2 separates the North Hostetter field and Hostetter field structures. This fault is very similar to fault No. 1. It cuts the North Hostetter field wells at depths from —5,050 ft. in the Sunray 1 Penn, Section 55, to —6,550 ft. in the Sunray et al 1 Rhode Unit, Section 54. The throw of this fault is not as great at the Queen City level as fault No. 1, varying from 180 ft. at —5,050 ft. to 350 ft. at —6,163 ft.

Even though the faults are not confined to the structures and are somewhat regional in nature, they are accentuated in displacement on structure suggesting structural growth during the time of faulting.

- The series of probable faults indicated as No. 3 on Fig. 2 appear to be a shatter zone out away from the line of greatest weakness. The Hostetter structure may have been present during the time of the major faulting to the northwest and the small faults a result of adjustment in the competent area.

The age of the large faulting seems to be Jackson or later because fault No. 2 cuts the Hamon field wells from about —1,600 ft. to —2,050 ft. where the top of the Jackson is approximately —1,400 ft.; the age of the smaller faults in

THE AUTHOR

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Hostetter field proper is not definitely known due to lack of control to the west making it impossible to determine the youngest beds cut.

It is very doubtful that these faults go very high in the section and the energy might have been absorbed in the shale section between the Queen City and the Carrizo-Wilcox. It has been suggested by some that the missing sections in Hostetter field may be due to an unconformity. Much more detailed work would be necessary to prove or disprove this idea.

To date there are only three producing horizons in the fields, the Queen City, top of the Carrizo-Wilcox sand section, and the lower Wilcox sand section. A middle Wilcox sand appears potential by electrical-log intrepretation but to date it has not been wireline cored or drill-stem tested.

Queen City . . . This sand varies in thickness up to 30 ft. and carries shows in almost every well. It is fine grained, brown to gray, fairly hard sand, and in most cases lacks permeability.

To date only two wells are completed in this sand, the Sunray et al 1 Renshaw and the Midstates 1 Berger Unit. The Sunray et al 1 Rhode Unit indicates it is capable of production by the electrical log and sidewall cores. Core analysis gives an average of 18 md. and porosity of 21 per cent with average total water saturation by percentage of pore space of 54.4.

Top Carrizo-Wilcox . . . The first sand member of the Carrizo-Wilcox section is the main pay for Jake Hamon and North Hostetter fields. It is a brown, fine-grained, somewhat dirty, porous, at times friable sand. Very often this sand will be contaminated with small chunks of lignite and inclusion of shale, giving the impression that at the time of deposition the area was in slow subsidence and located on or near a delta. Flood plain deposition may have taken place during upper Carrizo time which left poorly sorted material to be covered by Recklaw marine shale.

There are four wells in Jake Hamon field producing from the first Carrizo-Wilcox sand. In the Hamon 1 Rhode it has an approximate average permeability of 149 md. and average porosity of 19.0 per cent. Percentage of water saturation by pore space average about 43.8.

North Hostetter field has four wells completed in this sand and an average permeability for three of the four is 237.9 md., average porosity 21.4 per cent, and average total water by pore space 44.3.

In Hostetter field proper, the upper Carrizo-Wilcox sand has indicated by open-hole test that it is productive in the Sunray 1 Yeager. In this well there is an average permeability of 52 md. and average porosity of 22.5 per cent with average total water by pore space being about 57.0.

Lower Wilcox . . . The producing zones of Sunray's 1 Hostetter and 1 Yeager fall within the lower Wilcox. The Scibienski 1 G. Lowe in Survey 38 has also been completed from this section but the amount of producible gas is nearly noncommercial. The sands at this depth are fine grained to very fine grained, gray, hard, with many shale streaks. The average permeability in the Sunray 1 Yeager, the only well with core analysis in this section, ranges from 0.3 to 5.0 md. with porosities from 15.4 to 19.8. Average water by pore space is from 47.5 in the zone with some permeability to 68.8 in the zone of 0.3 md. average.

The collecting gas lines for the Hostetter area are the Wilcox Gathering System and Texas Eastern Transmission Co. Both the North Hostetter Carrizo and Queen City production and the Hostetter lower Wilcox production is, or is to be, tied into the Wilcox Gathering System. Jake Hamon field is produced into the Texas Eastern line.

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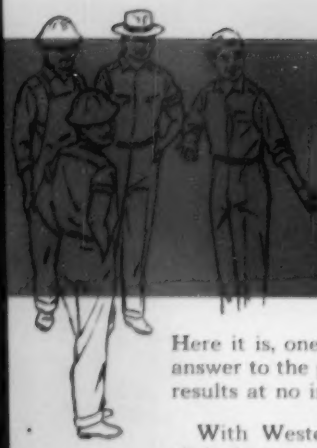

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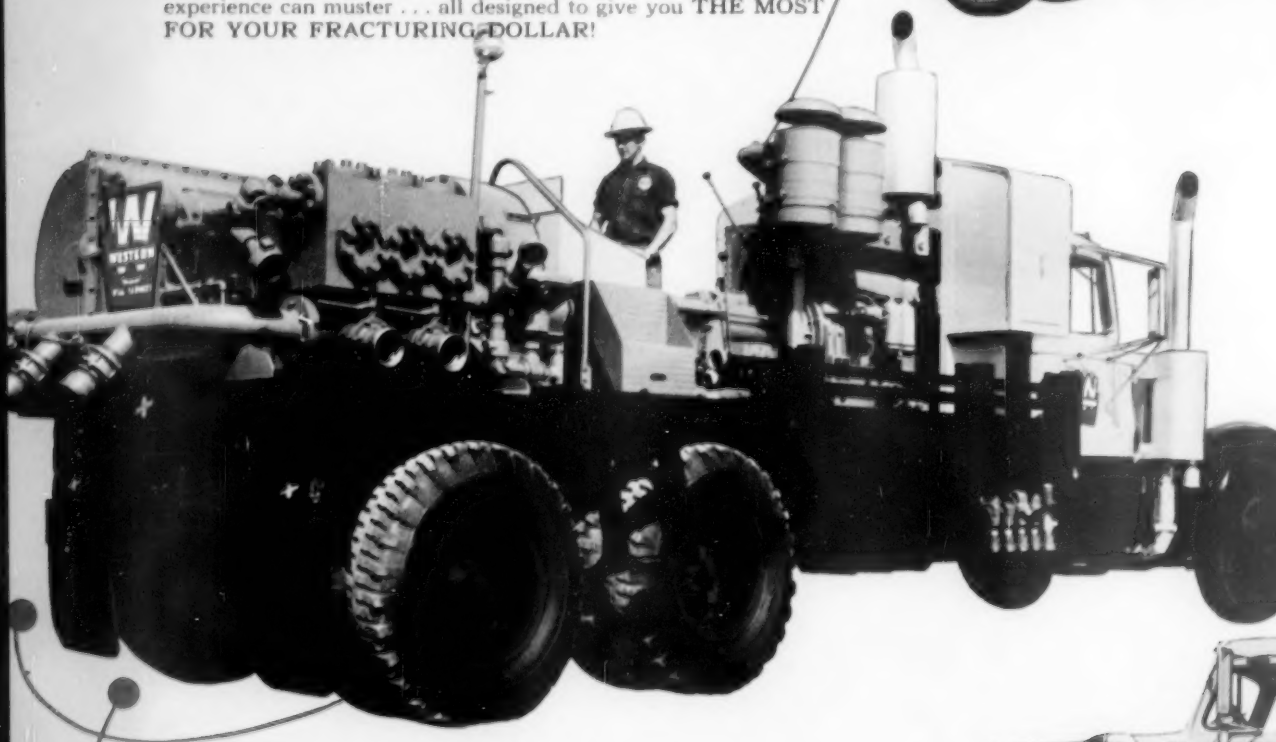

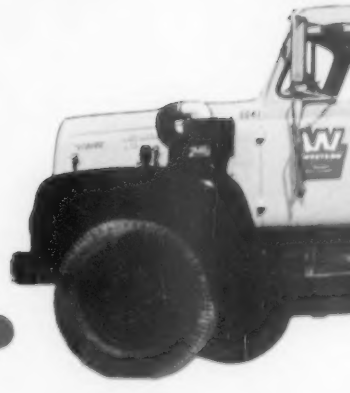

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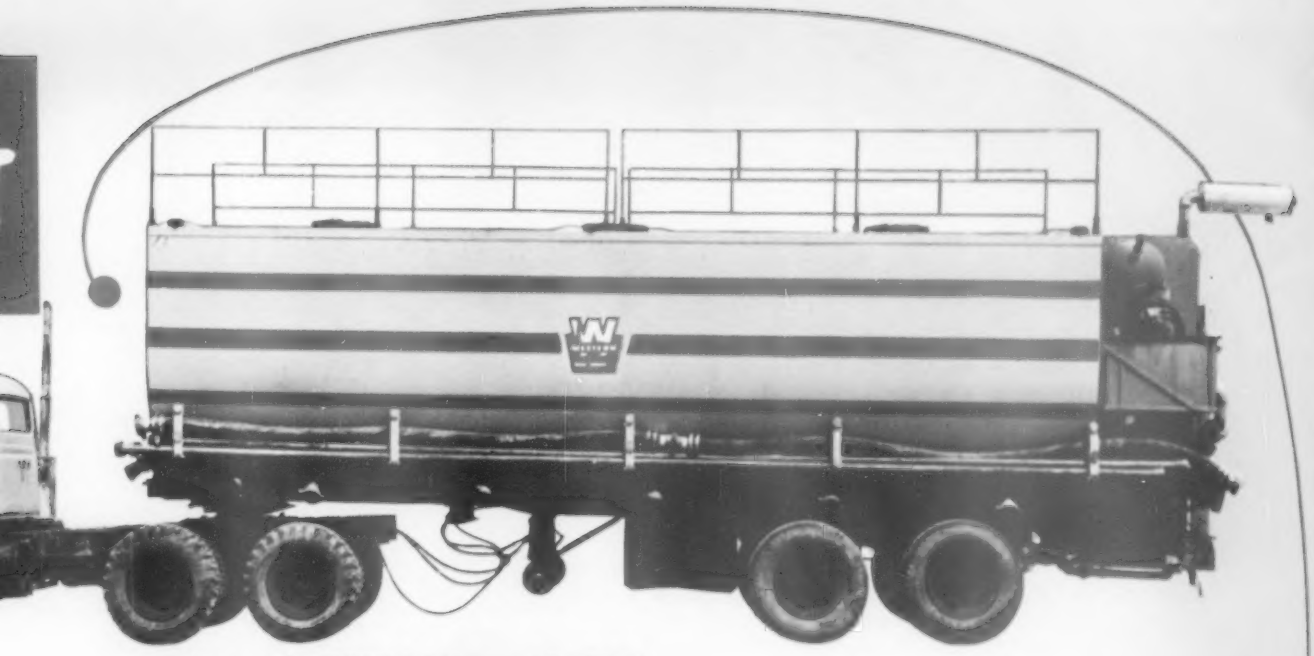

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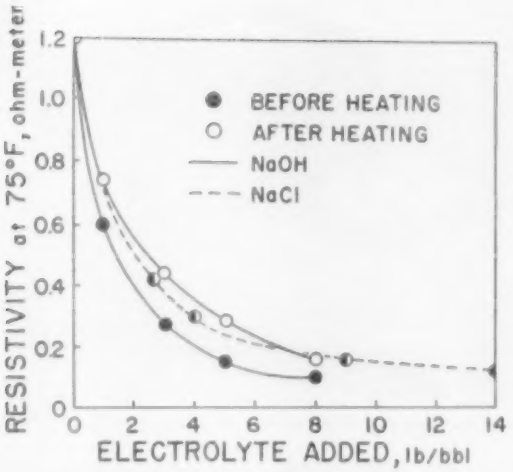
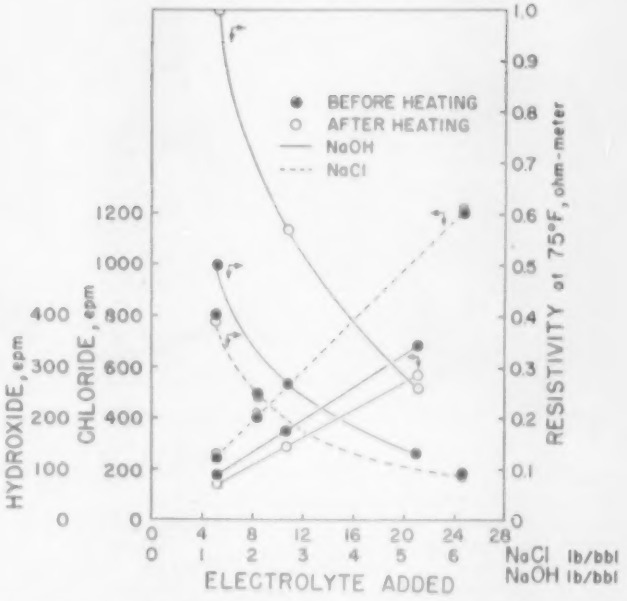


CHANGES IN RESISTIVITY in field muds containing sodium chloride or sodium hydroxide after heating 16 hours at 225° F. Fig. 1.



EFFECT OF HEATING SOLUTIONS of sodium chloride and solutions of sodium hydroxide with diatomaceous earth (16 hours at 225° F.). Fig. 2.

TEXAS TODAY

What Drillers Have Learned About Mud

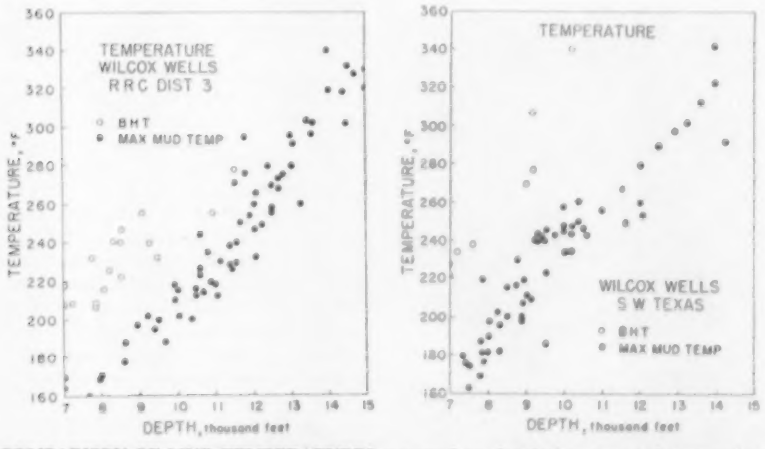
. . . along the Wilcox Trend of Texas

by George R. Gray and W. C. Kellogg

DRILLING along the Wilcox Trend presents almost all of the problems in mud engineering which are to be found in any region of like size. Loss of circulation, sloughing shale, high pressures, and high temperatures and contamination of the mud by anhydrite and salt are not common throughout the area. But one or more of these problems may be met in almost any limited locality along the Wilcox Trend; and all might cause trouble in a single deep well in South Texas.

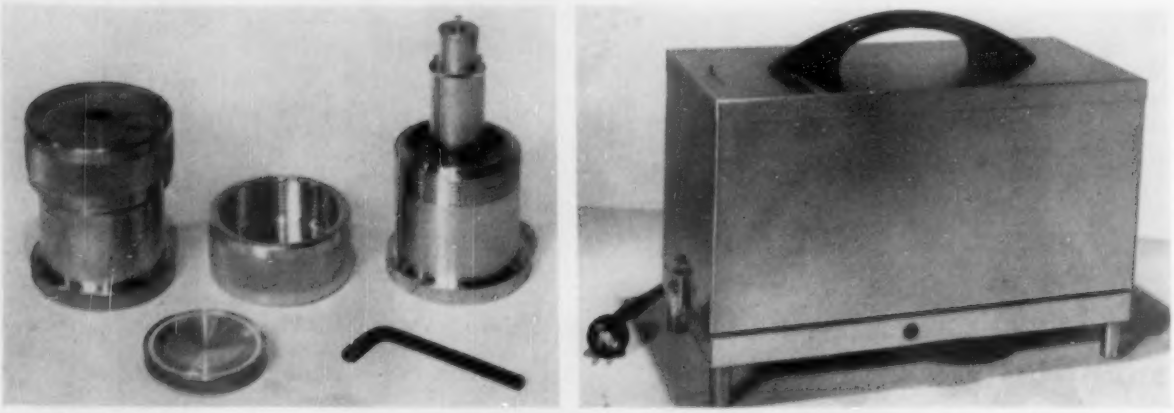
Authors are with Baroid Division, National Lead Co. Paper presented at the Eighth Oil Recovery Conference, "A Symposium on the Wilcox Trend of Texas," Texas Petroleum Research Committee, April 4 and 5, 1955, College Station, Tex.

Muds weighing over 12 lb. per gal. are seldom needed above 10,000 ft. in the upper Gulf Coast, or above 8,000 ft. in Southwest Texas, and mud practices to these depths are fairly uniform. In some cases, resistivity of the mud is reduced to improve the electrical log. Oil-emulsion muds are in common use to speed up rate of penetration. Mud costs range from $5,000 to $10,000. For deeper drilling, costs increase proportionately as drilling problems multiply. Mud weights in excess of 17 lb. per gal. are required to control pressures. Temperatures above 350° F. have been recorded. Particular attention then must be given to the mud treatment. Trouble from solidification of heavy mud at high temperature has been avoided by careful control of solid content and alkalinity.



COMPARISON OF MUD TEMPERATURES measured on electrical surveys with bottom-hole temperatures. (Left) Railroad Commission District 3, and (right) Southwest Texas. Fig. 3.

Wilcox Trend . . . Almost 300 fields in Texas are producing from the Eocene Wilcox. These fields are scattered through 32 counties, and lie in a band roughly 50 miles wide, 60 to 80 miles inland from the Gulf of Mexico, and



EQUIPMENT USED BY mud engineers in testing performance of mud at high temperatures. (Left) storage cells, and (right) oven. Fig. 4.

stretching from the Sabine River to the Rio Grande. Production may be found from as shallow as 500 ft. to yet-to-be-determined depths below 15,000 ft.

We have chosen to deal in general with the mud program for wells drilled to not more than 8,000 to 10,000 ft., and to treat separately some of the specific problems which are met in reaching these and greater depths.

General Drilling-Mud Practices

Drilling surface hole . . . A three-way blade bit is used to drill from 75 to 90 ft. of 22-in. (or 24-in.) hole in which 18-in. (or 20-in.) conductor pipe is set. Drilling usually is resumed with a 15-in. rock bit (soft-formation head), although occasionally a three-way blade bit is used. Starting mud is prepared from bentonite, and sometimes other drilling clays, with lime added to produce a thick gel. Water of satisfactory quality for mixing mud is obtained from wells 50 to 600 ft. deep. Mud may be hauled by vacuum truck from reserve pits of completed wells. Mud may be lost into the beds of gravel and sand, and sometimes fibrous and granular materials are added to the thick, gelled mud. The depth at which surface casing is set depends on the depth of the fresh water sands and ranges from about 1,000 to 3,000 ft.

From surface casing to completion above 10,000 ft. . . . It is difficult to make generalizations about the mud program and drilling problems for the interval from 3,000 to 10,000 ft. Depths to the top of the Wilcox vary several thousand feet over the large area under consideration and, even within a relatively small area, differences in lithology and formation pressures may significantly affect the mud properties needed for safe drilling.

Either a 9⅞ or an 8¾-in. soft-formation rock bit is used to drill out of surface casing. Drilling is begun with the pits filled with water and as drilling progresses, water is added to keep the mud weight below 10 lb. per gal. Before the first trip is made, a small amount of caustic-tannin mixture may be added to the mud to disperse the clay and reduce thickness of the filter cake. At about 5,000 ft., the addition of bentonite is begun in the amount of three to five sacks per tour. Caustic-tannin, or caustic-mined lignin (humic acid), is added in amounts of 50 to 100 lb. per tour. Mud properties at this time are roughly: weight, 10 lb. per gal.; funnel viscosity, 40 seconds; Stormer viscosity, 25 cp.; initial gel, 0 g.; 10-minute gel, 15 g.; filtrate, 15 to 20 cc.; pH, 9.

For the deeper wells, the mud program to be followed is initiated about 1,000 ft. above the top of the Wilcox.

TABLE 1—TYPICAL MUD PROGRAMS ON DEEPER WILCOX WELLS

Type mud treatment—	Weight (lb./gal.)	Funnel viscosity (sec.)	Stormer viscosity (cp.)	Initial gel (g.)	10-min. gel (g.)	Filtrate (cc.)	pH
Bentonite*	10.6-10.8	55-65	45	0	20	7-9	8-9
Oil emulsion	10.5-10.8	50-60	30-40	0	20	5-7	9-9.5
Lime treated	10.6-10.8	50-55	30-40	0	0	3-5	12-12.5

*Program used above 10,000 ft., in upper Gulf Coast.

RETORT used to determine liquid and solid content of mud. Fig. 5.

The programs in common use are: (1) treatment with bentonite, caustic-tannin and polyphosphate; (2) preparation of oil emulsion treated with caustic-mined lignin and tannin; or (3) preparation of lime-treated mud (Table 1).

If the treatment with bentonite, tannin, and polyphosphate is adopted, the amount of bentonite added per tour is increased to six to eight sacks and about 50 lb. of caustic soda and 100 lb. of tannin are added per tour, along with 50 lb. of polyphosphate. The quantity of water added is decreased somewhat and the weight rises to 10.6 to 10.8 lb. per gal. The cost for mud is $5,000 to $7,000. From 30 to 45 days are required to drill from bottom of surface casing to 10,000 ft.

The use of oil-emulsion mud is favored because of improved bit performance and hole condition. So marked is the increase in rate of penetration with emulsion mud that some contractors offer to reduce the charge per foot if oil-emulsion mud is used. Caustic-humic acid compositions, or caustic soda and mined lignins, or tall-oil soap, is used to emulsify 10 to 12 per cent by volume of diesel oil in the mud. After an initial treatment of about 4 lb. of emulsifying agent per barrel of mud, daily maintenance requires about 100 lb. of dispersing agent per tour, and somewhat more periodically whenever oil is added. Typical mud properties for this program are shown in Table 1. Cost is about the same as for the bentonite treatment, $5,000 to $7,000. If pressures are normal, this program can be used to a depth of

about 12,000 ft. in the upper Gulf Coast and to about 9,000 ft. in Southwest Texas.

For deeper holes, or when salt is added to reduce the resistivity of the mud filtrate, a lime-treated mud is preferred. Frequently oil is emulsified in the lime-treated mud. In converting to a lime-treated mud, water is added to reduce the clay content and avoid excessive thickening. Then 1 to 3 lb. of tannin, 2 to 3 lb. of caustic soda, and 2 to 4 lb. of lime are added per barrel of mud. Mined lignin or calcium lignosulfonate may be used instead of part of the tannin. Pregelatinized starch (1 lb. per bbl.) or carboxymethyl cellulose (CMC) (0.2 lb. per bbl.) may be added to reduce filtration.

If an emulsion is prepared, mined lignin, or caustic-lignin composition, is added in the amount of 3 lb. per bbl. of mud, along with 10 to 12 per cent by volume of diesel oil. Normal treatment per tour is: 100 to 150 lb. lime, 100 to 150 lb. caustic-tannin or caustic-lignin, and 50 to 100 lb. starch or 15 to 30 lb. of CMC. When a lime-treated mud is used in drilling to about 10,000 ft., costs range from $7,500 to $10,000, provided mud weight above 11 lb. per gal. is not required.

Mud programs for deep wells . . . The difficulties associated with outlining a general mud program for deep Wilcox tests have been mentioned earlier. The localized occurrence of zones of abnormal pressure requires that all records of wells in the vicinity be studied to properly plan the casing and mud program for a wildcat well. Only if no wells have been drilled near proposed location should dependence be placed on a general program for the area.

In the eastern part of Railroad Commission District 3, abnormal pressures have been encountered about 10,000 ft. Casing should be set before drilling into the high-pressure zone to prevent loss of circulation when the mud weight is raised as high as 15 lb. per gal. A lime-treated oil-emulsion mud is desirable for further drilling.

In the southwestern part of District 3, conversion is made to lime-treated mud after 10¾-in. casing is set at about 6,000 ft. The treating program has been described in the preceding section. Suggested mud properties are:

Depth (ft.)	Weight (lb./gal.)	Funnel (sec.)	Filtrate A.P.I. (cc.)
6,000	10.5	40-45	10
7,000	11.0	40-45	8-10
8,000	11.5	40-45	6-8
9,000	12.0	45-50	4-6
10,000	12.5	45-50	4
11,000	13.0	50-55	3-4
12,000	14.0	55-60	3-4
13,000	15.0	55-60	3-4
14,000	16.5	60-65	3-4
15,000	17.0	65-70	3

In Southwest Texas, the problem of suggesting a general mud program is even more difficult. Depths at which abnormal pressures are found vary widely, as is illustrated by the tabulation below of mud weights required in

Depth (ft.)	Pounds per gallon				
	Live Oak	McMullen	Duval	Webb	Zapata
5,000	10.0	10.0	10.0	10.0	10.5
6,000	10.5	10.0	10.5	10.5	10.7
7,000	11.5	10.5	11.0	11.0	11.0
8,000	16.0	11.5	11.5	12.0	12.5
9,000	16.0	15.0	12.0	12.0	13.5
10,000	16.0	16.5	16.0	12.0	14.5
11,000		16.5	16.0	12.5	15.0
12,000			16.0	13.5	15.0
13,000			16.0	16.5	15.5
14,000			16.0		15.5

drilling wells in five counties along the Wilcox Trend.

Other mud properties are much the same as those illustrated for District 3.

Special Problems

High pressures . . . The existence of abnormal pressures at widely varying depths is responsible for the vagueness and uncertainty of the mud programs outlined in the previous section. In general, pressures in the Wilcox sands are normal (0.465 psi. per foot of depth), or below normal, to depths of about 8,000 ft. At greater depths in the Wilcox in South Texas, abnormal pressures

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are found so frequently as to become almost a "normal" occurrence. Examples are: Clay West field, Live Oak County, 6,350 psi. at 9,450 ft.; Hostetter field, McMullen County, 7,854 psi. at 10,250 ft.; Hagist Ranch field, Duval County, 6,975 psi. at 9,650 ft., and Zapata County, 6,200 psi. at 9,689 ft. Many others could be listed but these are enough to point out the need for careful practices in exploratory drilling.

Sloughing shale . . . Trouble from sloughing shale frequently occurs some time after the shale has been drilled. Generally, the shallow shales are drilled rapidly with a mud having a fairly high filtrate (15 to 20 cc.) without difficulty. Sometimes when the harder formations are encountered and drilling rate declines, trouble occurs from sloughing of the shale. Insufficient drill collars may allow the pipe to be put in compression and whipping of the pipe will break down the shale. Increasing the weight of drill collars will remove the cause of the sloughing and raising the viscosity of the mud will help clean the hole of cavings.

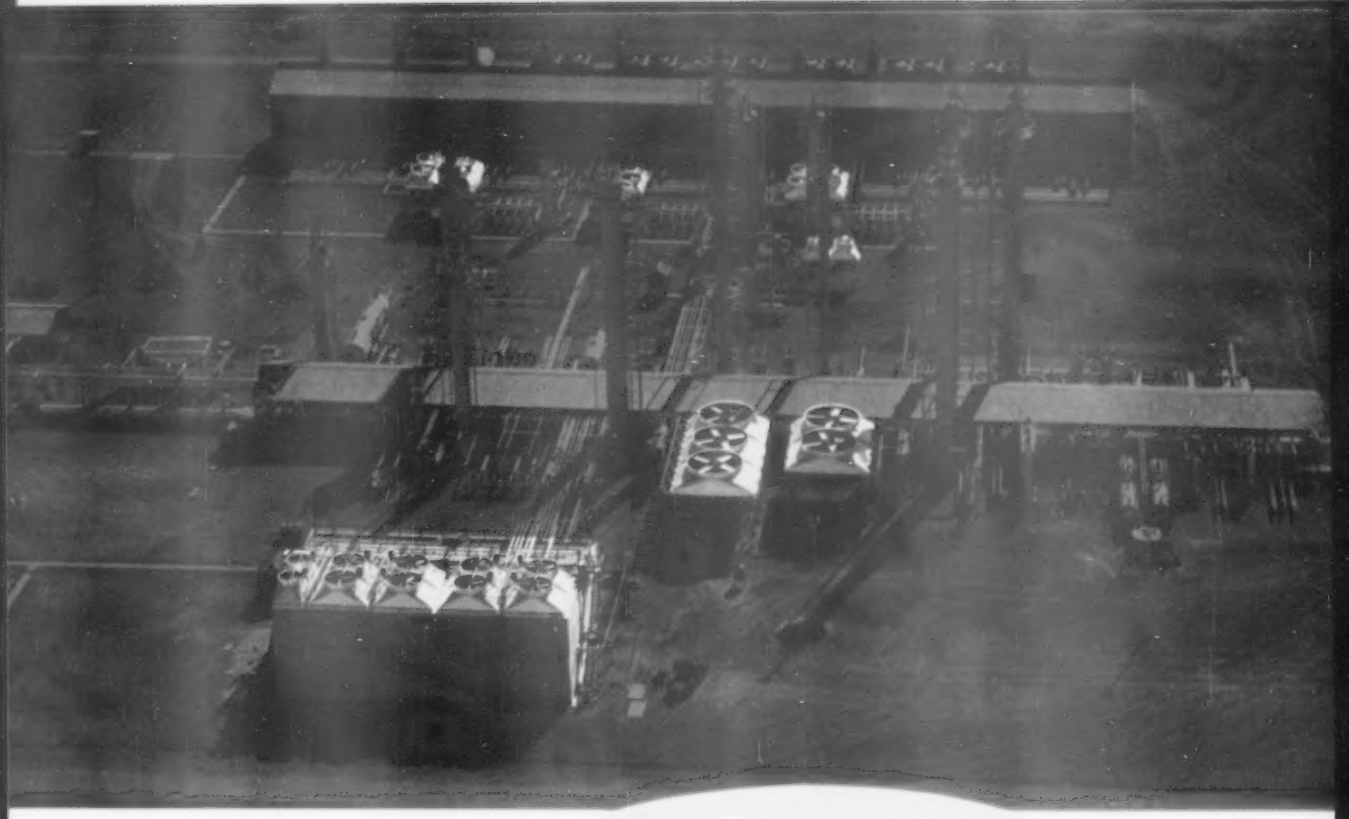
Loss of circulation . . . Loss of circulation is not considered a major problem in drilling along the Wilcox Trend, although in some wells it is very troublesome and is responsible for a significant part of the mud cost. Mud often is lost in small amounts into the beds of sand and gravel which must be penetrated before surface casing is set.

The means employed to stop loss of mud vary, of course, with the conditions responsible for the loss. The first step, if possible, is to reduce the mud weight. If returns are not secured at the minimum safe mud weight, a 50 to 200-bbl. batch of mud is mixed containing 15 to 20 lb. per barrel of fibrous, flake or granular material (or mixtures of these) and the batch is placed in the zone of loss. Pipe is pulled above the zone of loss before beginning circulation and then the bit is gradually worked to bottom. Infrequently it is necessary to use plugs of bentonite-in-oil or gel cement. Before loss of mud occurs, mica or walnut shells ground fine enough to pass the screen of the shale shaker may be added as a preventive measure.

Control of mud resistivity . . . In the upper Gulf Coast, interpretation of electrical logs of the lower Wilcox is complicated by the presence of lignite streaks, lignitic shales, and by invasion of mud filtrate into the sands. Invasion of filtrate of high resistivity (order of 1 ohm-meter) is particularly objectionable because of the low porosity and the nature of the formation. Significant improvement has been made in the quantitative evaluation of electrical logs by using mud of controlled resistivity and low filtration in conjunction with the focused type of resistivity measurement. Because the magnitude of the self-potential decreases with decrease in mud resistivity, a lower limit is imposed on resistivity. Experience has shown that if the mud resistivity is held at four or five times that of the water in the formation, the self-potential curve on an amplified scale is adequate and the objectionable effect of invasion of filtrate is greatly diminished. The reliability of the quantitative estimations based on the S.P. curve is imposed because of the smaller contrast between the resistivities of the filtrate and the interstitial water.

Fig. 1 shows the effect on the resistivity of a field mud of adding sodium chloride or sodium hydroxide, and the changes in resistivity which occurred when the muds were heated 16 hours at 225° F. Practically no change in resistivity occurred on heating the samples treated with salt, while the resistivity of the samples treated with caustic soda increased 25 to 75 per cent.

The alkali reacted with the clay and sand in the mud, causing the increase in resistivity. That such a reaction may cause a large change in resistivity of



HUDSON Solo-aire and Combin-aire COOLING UNITS

minimize water consumption in the Pegasus Plant of Magnolia Petroleum Company, Midland County, West Texas

Pictured in the foreground is the HUDSON Combin-aire unit, with Solo-aire units in the background. Air is used directly for cooling in the Solo-aires where low temperatures are not required. The Combin-aire uses a small quantity of water to precool the air so that entering hot fluids may be cooled to effluent temperatures lower than those obtainable by direct use of air.

If the total heat load of this plant had been dissipated thru a conventional cooling tower, 158 million gallons of water per year would have been required for makeup. The actual annual water makeup for the plant is only 17 million gallons per year. In this plant the use of the Solo-aire and Combin-aire have proven advantageous, resulting in savings in first cost, in operating costs for horsepower, water treating, and maintenance, and in obviating necessity for drilling of several water wells. Savings in cost of piping result thru installing the Combin-aire in close proximity to process equipment, made possible because the effluent high temperature air is always under-saturated with water vapor and nuisance and high maintenance cost due to water carryover or condensation are eliminated.

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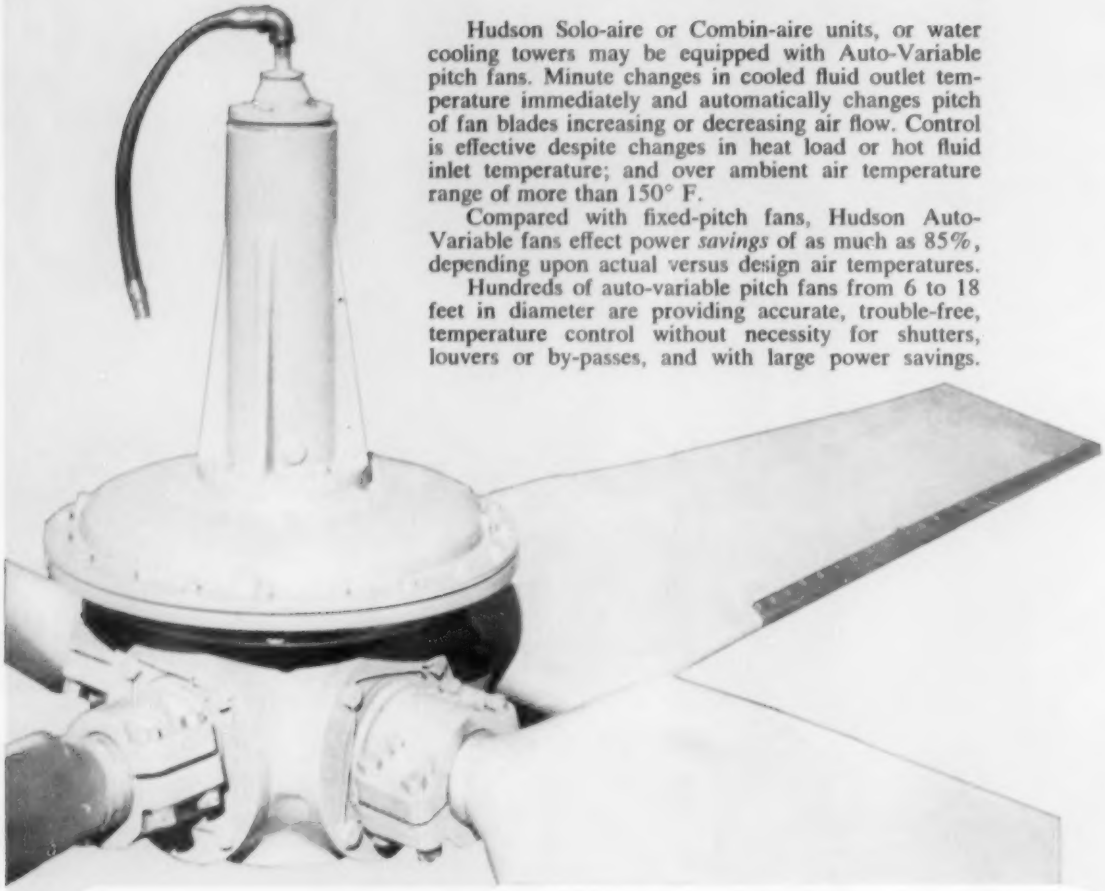

Hudson Solo-aire or Combin-aire units, or water cooling towers may be equipped with Auto-Variable pitch fans. Minute changes in cooled fluid outlet temperature immediately and automatically changes pitch of fan blades increasing or decreasing air flow. Control is effective despite changes in heat load or hot fluid inlet temperature; and over ambient air temperature range of more than 150° F.

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- **Have all moving parts of control mechanism completely enclosed and weather-proofed.**

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Hudson Auto-Variable Pitch Fan is protected by U. S. patents and patents pending.

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mud filtrate is evident from Fig. 2, in which is shown the results of heating solutions of sodium chloride and of sodium hydroxide with diatomaceous earth (silica) in airtight containers. After heating 16 hours at 225° F., alkalinity of the sodium hydroxide solutions heated with the silica had decreased, with a corresponding increase in resistivity, while there was no significant change in the concentration or resistivity of the sodium chloride solutions. Another portion of the most concentrated sodium hydroxide solution was unchanged in concentration after heating without the silica.

From the standpoint of ease of control of properties, lime-treated muds are the most satisfactory for maintenance of low resistivity. Salt can be added to lime-treated muds without an objectionable increase in gel strength. The amount of salt required ranges from 1.5 to 6 lb. per barrel, depending upon the resistivity wanted.

Contamination by salt and anhydrite . . . In Wilcox drilling, contamination of mud by salt occurs only as a result of a salt-water flow. No beds of salt are drilled. The first step in control, of course, is to raise the density of the mud high enough to stop the influx of salt water. Treatment then is begun to counteract the effect on the mud. Lime-treated muds withstand a higher concentration of salt without serious flocculation than do medium-pH muds treated with caustic-tannin, and these, in turn, are less affected than lightly treated bentonite-shale muds.

Contamination of the mud by anhydrite is evident only in South Texas, where the anhydrite occurs in stringers and veins in shale above the Wilcox. Anhydrite causes an increase in gel strength, gel rate, and filtration of the lightly treated muds in use at that depth. From 0.5 to 2 lb. of soda ash per barrel of mud, along with about 1 lb. of organic thinner, reduces gels and filtrate. Polyphosphates also are effective. About 25 lb. of soda ash per tour, along with the usual chemical treatment, will keep the mud in condition while the anhydrite-bearing shale is being drilled.

High temperatures . . . High temperatures in deep wells create problems in the control of mud properties. High temperatures affect the components of the mud by increasing gelation of clays; decomposing dispersing agents; degrading organic filtration-reducing materials, and accelerating the reaction of alkalies with the siliceous constituents. These alterations tend to produce thick muds having high filtration rates. Such muds interfere with drilling and completion operations in many ways, for example, by requiring extreme pressures to break circulation after a trip; by sticking drill pipe and testing tools; by preventing logging and perforating tools from reaching bottom, and by sticking packer and tubing in completed wells.

The temperature gradient in fields along the Wilcox Trend ranges from 1.7° to 2.3° per 100 ft. Fig. 3 shows some bottom-hole temperatures in Wilcox fields and also a number of measurements of mud temperatures made while running electrical logs.

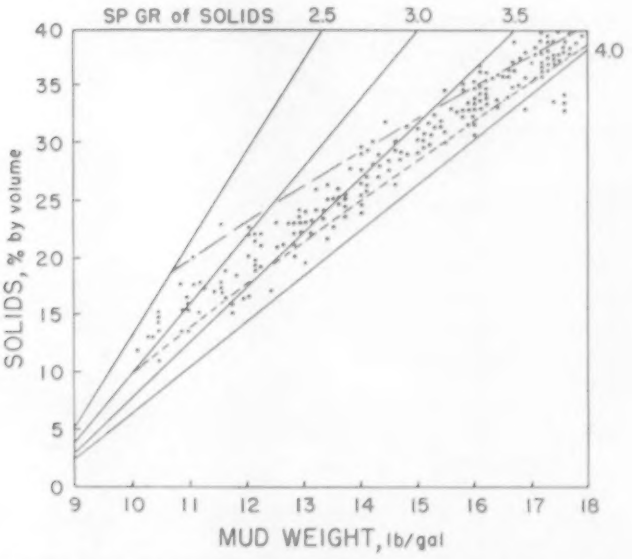
While no definite temperature can be set at which temperature becomes a serious problem in mud control, difficulties frequently are noted at about 250° F. The effective life of polyphosphate thinners is reduced materially as the temperature approaches 200° F. Accordingly, phosphates are seldom used deeper than 10,000 ft. in District 3, or below 8,000 ft. in Southwest Texas. Quebracho and mined lignin are more stable, although they show evidence of breakdown at 325° F. Starch is less effective than CMC in maintaining low filtration at high temperatures. Caustic soda and lime in strongly alkaline muds react with the clays and sand present to form calcium silicates of uncertain composition.

These products cause the mud to solidify on standing at high temperatures. Stability of lime-treated mud at high temperature is improved by keeping the concentrations of caustic soda and lime low. Low clay content is desirable, and also a moderately high concentration of organic dispersing agents. Successful control of mud properties in hot holes is dependent on a regular program of testing at temperatures higher than that to which the mud is being subjected while drilling. Fig. 4 shows equipment used by mud engineers in making such tests. In the routine testing program, particular attention is paid to alkalinity and solid content.

Control of solid content of mud . . . It has long been recognized that not only the quantity but also the composition and structure of the suspended solids are important in the regulation of mud properties. Increasing attention has been given in recent years to control of the solid content of mud. The desirable features of "low solids" muds have been extolled without defining the term and comparisons have been made between "low solids" and "high solids" muds without stating the percentage of solids in either.

With the introduction of oil-emulsion muds, field equipment was devised to determine oil, water, and solid content. In this apparatus (Fig. 5) the oil and water are distilled from a measured volume of mud. The volumes of the condensed oil and water are measured and the volume of the solid is found by difference.

Sometimes, however, in the routine treatment of weighted muds, the relations between specific gravity of the solids, the volume occupied by the solids, and the density of the mud are



RELATION BETWEEN specific gravity, mud weight and percentage by volume of solids in the mud. Data points are measured solid contents of field muds. Fig. 6.

overlooked. The relations between these quantities are shown in Fig. 6 for specific gravities of 2.5, 3.0, 3.5, and 4.0 and for the mud weights of 9 to 18 lb. per gal.

On the same chart (Fig. 6) have been plotted the results of numerous determinations of the solid content of muds ranging in weight from 10 to 18 lb. per gal. These data are measurements made in the field on muds considered representative of the fresh-water muds in common use in the Gulf Coast. Included are many examples of the types of mud employed in drilling along the Wilcox Trend. Most of the muds had been in use for some time and the heavier muds, in general, had been thinned as much as possible by chemical treatment.

We have had the temerity to draw two dotted lines on the chart. The upper line indicates an upper limit of volume of solids for satisfactory control of flow properties, while the lower line is suggested as a more desirable composition from the standpoint of ease of control. We do not mean to imply that any mud having a solid content above the upper line is defective in performance nor that one having a solid content below the lower line is intrinsically superior.

Most muds having higher solid content than recommended here were performing satisfactorily at the time of the test but would tolerate only a slight increase in solids. Some muds having less solids had higher funnel viscosities but these muds could be thinned by chemical treatment, and others showed evidence of settling which could be stopped by adding a small amount of CMC.

A survey of mud records for several wells drilled by the same contractor in a field in DeWitt County gave evidence of improved drilling rate with mud of lower content of shale solids. Emulsion muds, containing about 10 per cent oil, were used in all wells and mud properties, except weight, were similar: funnel viscosity, 45 to 50 seconds; Stormer viscosity, 40 to 45 cp.; gels, 0, and 5 to 10 g.; filtrate, 4 to 6 cc.; and pH, 9. For three wells, average solid content of the muds was 17.5 per cent by volume and weight was 10.5 lb. per gal., and for three other wells solid content was 13.3 per cent by volume and weight was 10.0 lb. per gal. Actual drilling times were not shown on the mud records but the elapsed time for the interval from about 5,000 to 8,000 ft. for the wells drilled with 10-lb. per gal. mud was only two-thirds that for the wells drilled with the mud of higher solid content.

The solid content of weighted muds cannot be controlled economically by dilution with water, as can be done with the natural shale muds.

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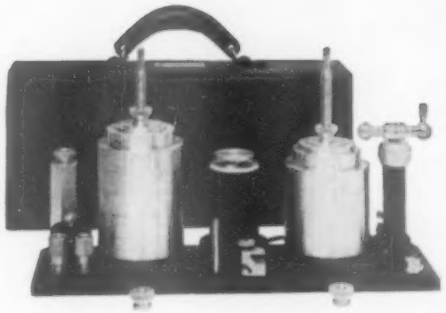

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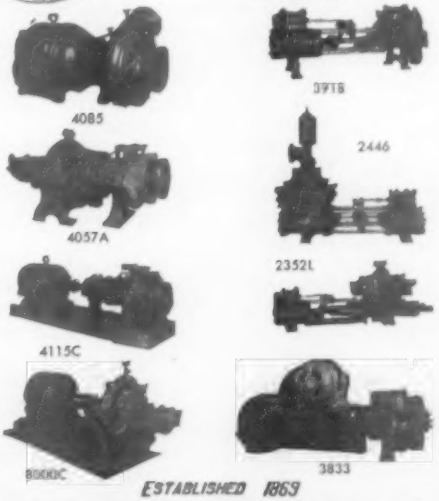

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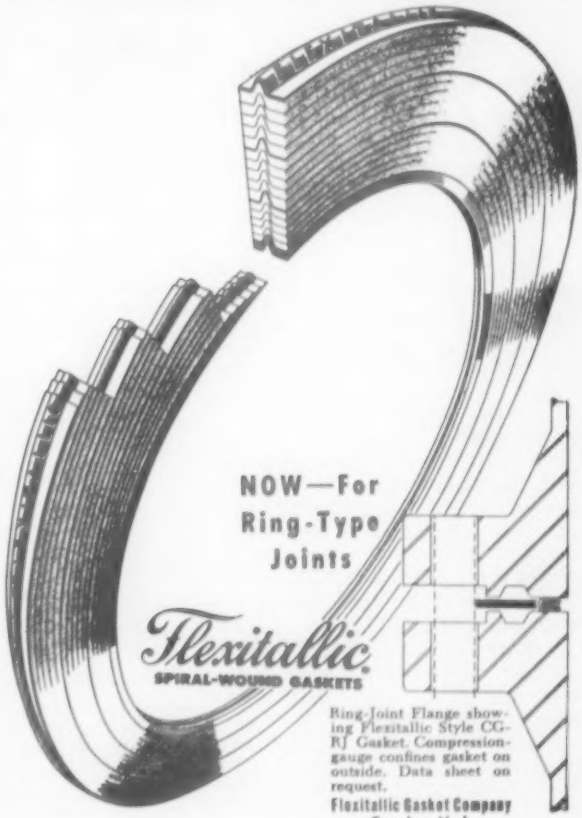

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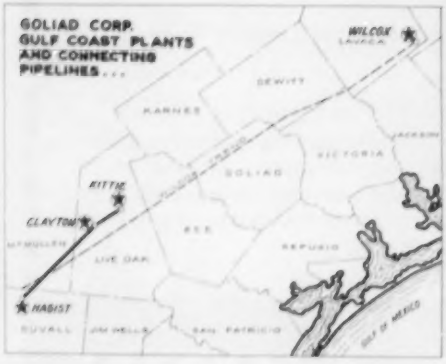
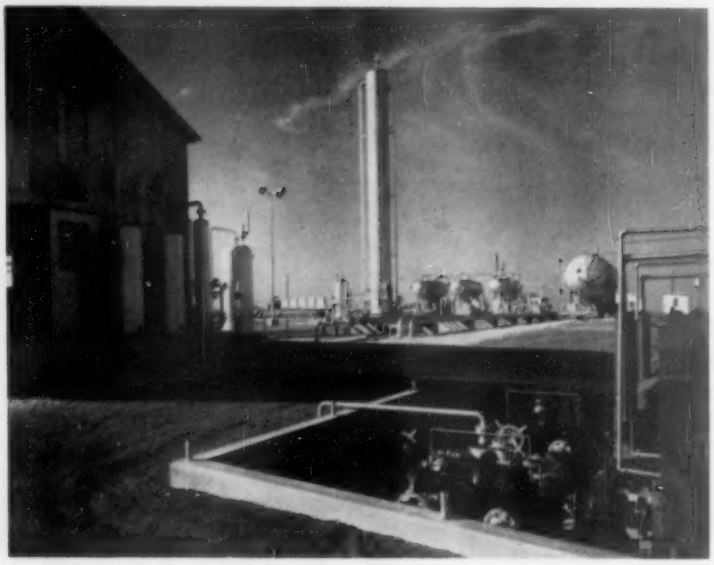




Problem: Linking several small reservoirs to produce feed volume to justify a plant

Gas Processing Along the Wilcox Trend

Four plants operate as single unit in an unusual scheme

by C. T. Wells, Jr.

WHERE gas reserves are small and widely scattered, economical processing of the production presents quite a problem. Often the solution lies in one or more of the following methods:

1. Remote absorption.

2. Absorption and distillation at one site and fractionation at a central plant.

3. Laying a pipeline and processing all reserves at a single site after they have been carried a considerable distance.

The above problem and its solutions apply precisely to the Wilcox trend in Texas. Here gas reserves, generally speaking, are situated in small reservoirs which seldom are large enough, in themselves, to support a single gasoline plant. Gas from these reservoirs is more or less constant in composition, and ratios of components recoverable by absorption are not high, particularly in comparison to percentages which might be recovered in a casing-head plant.

On an arbitrary basis of 50 per cent

Author is with Goliad Corp., Corpus Christi, Tex. Paper was presented at the Eighth Oil Recovery Conference of the Texas Petroleum Research Committee, held at Texas A. & M. College, College Station, Tex., 1955.

TEXAS TODAY

propane recovery, the Wilcox trend gas normally affords an over-all recovery of approximately 0.8 to 0.9 gal. of liquid products per thousand cubic feet of inlet gas.

Exclusive of the cost of a gathering system, a gasoline plant normally would cost between $25 to $35 for each gallon per day of recovered products capacity. For example, a 33,000-gal. per day recovery plant would cost approximately $1,000,000, while a 100,000-gal. per day recovery plant would cost approximately $2,500,000.

The 33,000-gal. per day plant would require about 45 M.M.c.f.d. of gas as feed, and the 100,000-gal. per day plant would require approximately 125 M.M.c.f.d. of gas as feed to its processing units.

There are few 45-M.M.c.f.d. fields along the Wilcox trend, and very rarely is there one capable of producing 125 M.M.c.f.d. But the labor needed to operate a 45-M.M.c.f.d. plant is almost as much as that for a 125-M.M.c.f.d. unit. So the smaller plant must be operated under a distinct labor disadvantage which radically affects its economics.

The problem along the Wilcox trend, then, becomes one of linking a number of small or intermediate-size reservoirs to produce a feed volume that will make construction of a gasoline plant economically feasible. This problem can be broken down into three basic situations, as follows:

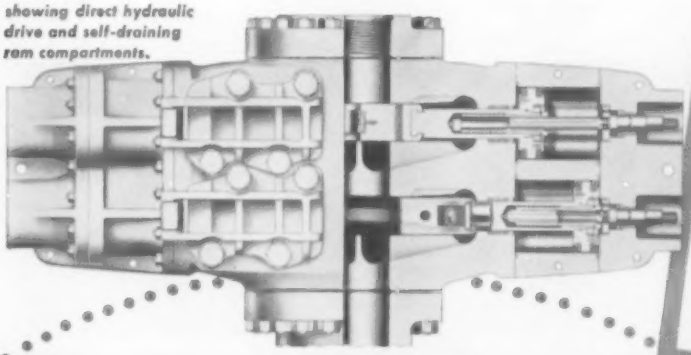
1. Processing of gas from a single pool which is large enough by itself to support a gasoline plant.

2. Processing of gas from intermediate-size reservoirs with a range of 30 to 40 M.M.c.f.d. deliverability. Operation of a gasoline plant, based on this reserve only is very marginal. This situation is further resolved into two subproblems: (a) intermediate-size reservoirs near a main plant, and (b) these reservoirs located a considerable distance from a main plant.

3. Processing of the combined gas from numerous small reservoirs stretched out over a considerable distance and with a single company taking all gas.

The first situation, where gas re-

CUTAWAY VIEW
showing direct hydraulic drive and self-draining ram compartments.



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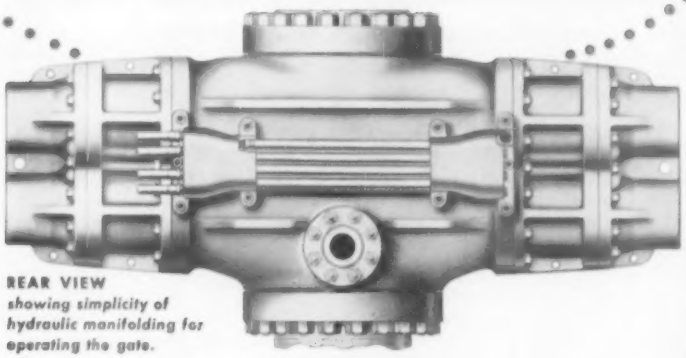

REAR VIEW
showing simplicity of hydraulic manifolding for operating the gate.

What do *you* value most in cellar control gate equipment? . . . Compactness? . . . Convenience? . . . Simplicity? . . . Safety? . . . Versatility? In Shaffer Hydraulic Cellar Control Gates you get all these—and more—to a degree unsurpassed by any other equipment. Compare—point by point, feature by feature—the *extra* values you get in Shaffer equipment, and you'll know why they are the choice of so many leading operators . . .

FIELD-PROVEN DEPENDABILITY

is probably the most important feature to look for in any pressure-protection equipment, and in Shaffer Hydraulic Gates you get safety backed by the organization that pioneered cellar control gates more than three decades ago. Successful from the first gate built, Shaffer Gates have nevertheless gone through a constant program of development to always keep ahead of the industry—and are today accepted as standard throughout the oil world.

SIDE DOOR RAM CHANGES

With Shaffer Hydraulic Gates there's no need to dismantle the gate each time the rams are changed. You simply open two doors in the side of the body, slide out the ram assembly, change rams, replace the assembly and bolt the doors shut. Closing the doors automatically aligns the rams within the body.

There's no need to allow extra room above the gate or at the ends to change rams—and complete ram changes can be made whether the pipe is **in** or **out** of the hole!

THREE-WAY COMPACTNESS

Space saved in the cellar is particularly valuable space. It means lower rig-up costs, smaller cellar requirements, simpler connections . . . and you save important space with Shaffer Hydraulic Gates. In all three dimensions—height, width and length—Shaffer Hydraulic Gates are unusually compact!

Even in sizes as large as 13⅜" (12" Series 900) Single Gates require only 18½" total height—Double Gates (two compartments in one body) only 30". There's no need for extra room above the Gates—nor need the compact length dimensions be expanded endwise—to permit ram changes.

SELF-DRAINING COMPARTMENTS

No detrimental sand or mud accumulations can interfere with free ram travel when you use Shaffer Gates. Note how the rams travel on high guide ribs above the steeply-sloped gate bottoms which quickly drain mud and sand back into the well. Also, since well pressure is free to flow to the back of the rams, it actually assists in the closing and sealing action.

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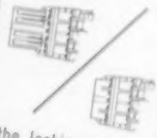

Whether you prefer the extra compactness of a non-rising shaft or the quick indication of ram position afforded by a rising shaft—you get the design **you** prefer from Shaffer. In both designs, built-in body extensions protect the locking shafts against damage in all positions—extended or retracted!

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on these and many other Shaffer advantages before you invest in any pressure control equipment. And for those who prefer mechanical operation, Shaffer also provides a complete line of Double and Single Mechanical Cellar Control Gates with rams that are interchangeable, size for size, with those in Hydraulic Gates. This saves on inventory, simplifies maintenance where both types are used. See your nearest Shaffer representative for complete details—or write direct.

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TEXAS TODAY

serves are sufficient in one spot to support a single gasoline plant, is merely a matter of straight economics. The problems which might be found in this type plant are those which are general to the natural-gasoline industry, and no purpose would be served discussing them.

In the second type problem we have intermediate-size reservoirs either near a main plant or removed a considerable distance from a main plant. This offers a point to be discussed and an illustration as to how an economical solution to this type of problem was obtained.

To illustrate, I would like to use as an example Goliad Corp.'s three plants located in Duval and Live Oak counties. These three plants, approximate locations of which are shown in the map, process a total of approximately 150 M.M.c.f.d.

The Hagist plant in Duval County processes about 50 M.M.c.f.d., while the Clayton plant in Live Oak County handles approximately 35 M.M.c.f.d. Our Kittie plant, located between George West and Three Rivers in Live Oak County, processes about 65 M.M.c.f.d.

A plant operating solely on any one of these three reserves would be very marginal, economicswise, but might under the best of circumstances be justified. However, by joining them into an integrated unit we feel that we have achieved a sound economic venture.

To accomplish this integration, we were required to construct three different types of processing plants, only one of which is a complete plant in itself.

The Hagist plant is located 36 miles from our main Kittie plant. With the knowledge that we were going to build a central complete plant at Kittie, we designed the Hagist plant so that it would have absorption and distillation facilities but no fractionation system. This arrangement was desirable for two reasons: (1) employing fractionation at the Hagist plant would mean a larger labor force as well as a greater initial investment, and (2) we did not have access to a railroad at Hagist.

Accordingly, as shown in diagram, the plant was constructed with just absorption and distillation facilities. The plant product—a mixture of unpurified recovered hydrocarbons—is pipelined to the main Kittie plant. Here it can be fractionated and the end product loaded into tank cars or tank trucks.

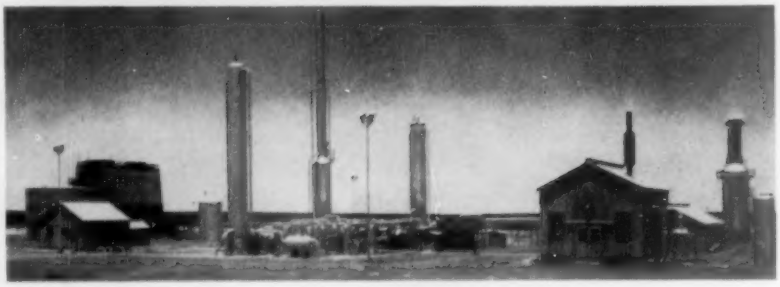
The Clayton plant, situated approximately 8½ miles from the Kittie plant, processes about 35 M.M.c.f.d. as mentioned previously. Since this plant is reasonably close to our Kittie plant from a pipelining viewpoint, we decided that here we would perform only the absorption step. The rich oil would be pumped to the Kittie plant for both distillation and fractionation.

As at Hagist, the amount of gas to be handled at Clayton was too small to allow distillation, fractionation, and loading. Here again, a railroad was not available, while Kittie is adjacent to a main line.

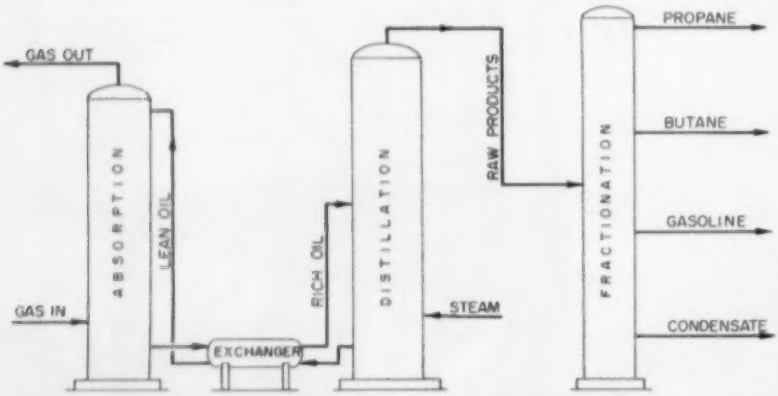
A further problem at this point was returning flash gases off the absorption step to the pipeline to which the processed gas was dedicated. This is accomplished by taking the high-pressure rich oil from the absorber and flashing it at 400 and 200 psig. The gases released in these two stages of flashing are compressed to pipeline pressure and returned through the absorber to the pipeline. The amount of gas remaining in the rich oil is only that sufficient to furnish fuel needed for distillation and fractionation of the recovered components of the Clayton gas.

The main Kittie plant contains complete absorption, distillation, and fractionation systems. But the absorption section of this plant is only large enough to handle the 60 M.M.c.f.d. of gas located adjacent to the Kittie plant site.

To summarize the above, the Kittie plant accomplishes fractionation of the raw products from the Hagist plant, it accomplishes distillation of the rich oil from the Clayton plant and fractionation of the products recovered in this distillation, and it accomplishes absorption, distillation, and fractiona-



The photographs on these pages show the four plants, those at Kittie and Clayton on the preceding page, and those at Wilcox and Hagist above. Only one of these is a complete plant in itself.



Flow plan of the Hagist plant, which was constructed with just the absorption and distillation facilities.

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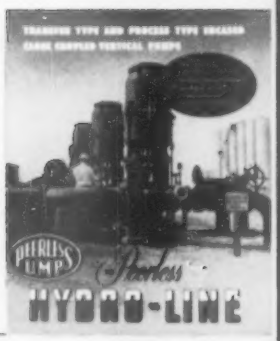

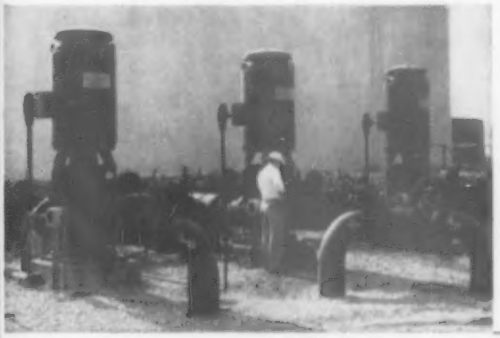

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tion of products from the gases in the Kittie plant area.

Thus, in building the Hagist, Clayton, and Kittie plants to form a unit, we have accomplished the following:

1. The processing of reservoirs that are of such a size that a gasoline plant would be very marginal if built for one reservoir alone—the solution of our second situation listed earlier.

2. We have been able to keep the flash gases produced in absorption steps at their original plant locations, so that these flash gases can be returned to the pipelines to which they are dedicated.

3. We have assembled our end products at a focal point which is both adjacent to rail facilities and closest to the general market consumption area in Corpus Christi.

4. This point is incidental, but worth mentioning. While both Hagist and Clayton both are poorly located in regard to water supply, Kittie has ample water, furnished by wells in ample quantity to allow complete processing.

I would like to point out, parenthetically, that Hagist is so poorly located for water supply that we decided to use oil-field waste water as our process water. Accordingly, we went over to Seven Sisters field and arranged to take salt water containing about 7,000 p.p.m. of dissolved solids to the Hagist plant. Here it is circulated through the cooling tower as our cooling medium. Naturally, we maintain a high blowdown rate on this cooling tower and, after a year's operation with the method, we have not encountered any really serious problems.

The Clayton plant has a very small fresh-water supply. Therefore for our engines we have employed aerial cooling, which requires only a moderate amount of makeup water. In fact, this makeup is so small it can be hauled conveniently from the Kittie site.

We have seen how Goliad solved the second of the basic problems we have listed. This brings us to the third and last situation enumerated—that of taking gas from numerous small reservoirs for profitable processing, with the take all by one company.

Here again I must use a Goliad venture for an illustration, but I must point out that we were not able to solve the problems single-handedly. We were able to build our Wilcox plant in Lavaca County near Hallettsville to handle 150 M.M.c.f.d. of inlet gas. But it took a separate organization to set up and operate the system that brings gas to the Wilcox plant from as far as 160 miles away. This is the Wilcox Trend Gathering System which has more than 100 meter connections to small fields and individual wells.

Processwise, the Wilcox plant is more or less of the conventional type, having complete absorption, distillation, and fractionation systems. The only unusual feature, perhaps, is the method employed to keep moisture from reentering the gas after dehydration.

As in many plants, inlet gas is passed through a dehydrator ahead of the absorption step, so that gas goes to the absorber with a very low-water content. At Wilcox, however, the lean oil is stripped by steam in the distillation unit, and thereby soaks up a goodly quantity of moisture. Ordinarily this mixture would be passed along to the gas in the absorber, and cause it to have a moisture content in excess of pipeline specifications, which usually is 7 lb. per M.M.c.f.

To prevent this "moist" oil from being pumped back over the absorber, we take lean oil off the base of the still and put it over the top of a 10-tray bubble column, or contactor. The fuel for the plant is preheated and introduced at the base of this contactor, intimately mixing with the oil coming down the column and stripping water out in the process. As a result, oil going from this contactor to the main absorber is practically bone dry, and no moisture is put back in the pipeline gas.

TABLE 1—GAS-PROCESSING SETTLEMENT CALCULATIONS—WILCOX PLANT

Purchase meter:	Gas processed (M.c.f.)	Content* (gal./M.c.f.)	Test (gal.)	Per cent of total test (gal.)	Allocable products sold (gal.)	Average price rec. per gal.	Net value
A	10,000	0.350	3,500	14	14,000	0.10	$1,400
B	12,000	0.410	4,920	20	20,000	0.10	2,000
C	8,000	0.380	3,040	12	12,000	0.10	1,200
D	6,000	0.360	2,160	9	9,000	0.10	900
E	14,000	0.350	4,900	20	20,000	0.10	2,000
F	16,000	0.390	6,240	25	25,000	0.10	2,500
Total	66,000		24,760	100	100,000	0.10	$10,000

*Determined by charcoal test.

TABLE 2—KITTIE-CLAYTON-HAGIST SALES AND PLANT PRODUCTION
(In gallons)

	Propane	Butane	L.P.G. mix	Gasoline	Total
Total sales	870,000	615,000	150,000	433,330	2,068,330
Average price received	0.06	0.08	0.08	0.10	0.08
Total net value	$52,200	$49,200	$12,000	$43,333	$156,733
Total products produced	870,000	615,000	150,000	433,330	2,068,330
Butane-propane split*	30,000	120,000	(150,000)		
Butane in gasoline†		65,000		65,000	
Total components to account for	900,000	800,000		368,330	2,068,330

*Composition of L.P.G. mix: butane 80 per cent, propane 20 per cent. †Composition of gasoline: butane 15 per cent, pentanes plus 85 per cent.

TABLE 3—KITTIE-CLAYTON-HAGIST CALCULATION OF GALLONS PER MINUTE AND ALLOCATION OF PRODUCTION BY COMPONENTS

	Gas processed in M.c.f.	Pod analysis	G.p.m.	Percentage of total	Production in gallons
Propane					
Stream A	900,000	0.800	720,000	45	405,000
Stream B	600,000	0.600	360,000	23	207,000
Stream C	700,000	0.700	490,000	32	288,000
Total	2,200,000		1,570,000	100	900,000
Iso and Normal Butane					
Stream A	900,000	0.300	270,000	31	248,000
Stream B	600,000	0.400	240,000	28	224,000
Stream C	700,000	0.500	350,000	41	328,000
Total	2,200,000		860,000	100	800,000
Pentanes Plus					
Stream A	900,000	0.200	180,000	31	114,180
Stream B	600,000	0.300	180,000	31	114,180
Stream C	700,000	0.300	210,000	38	139,970
Total	2,200,000		570,000	100	368,330

Accounting Problems

Actually, our big problem with the Wilcox plant was with the contract

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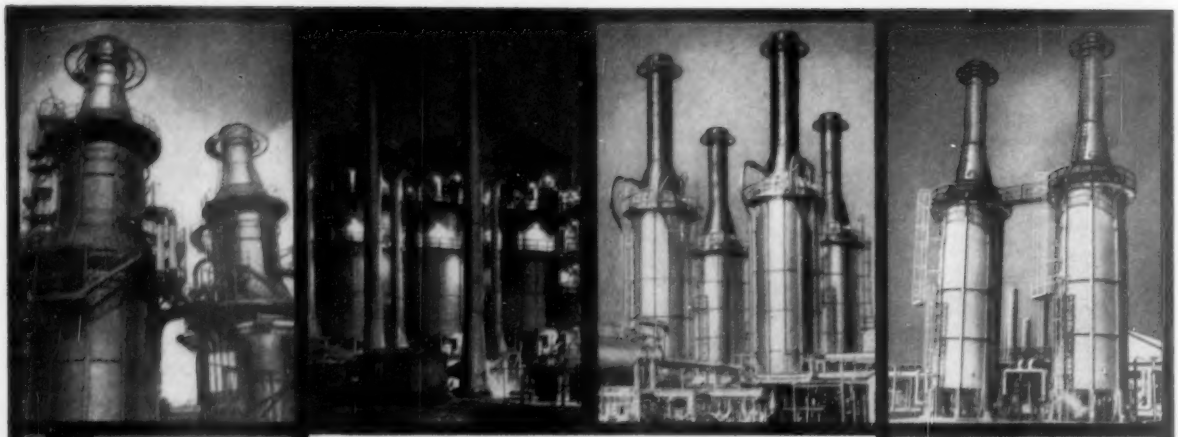

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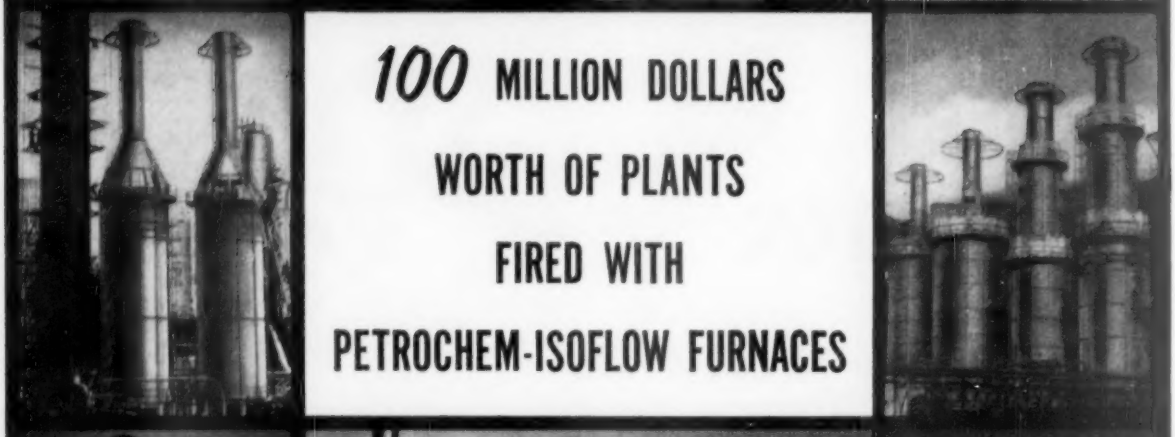

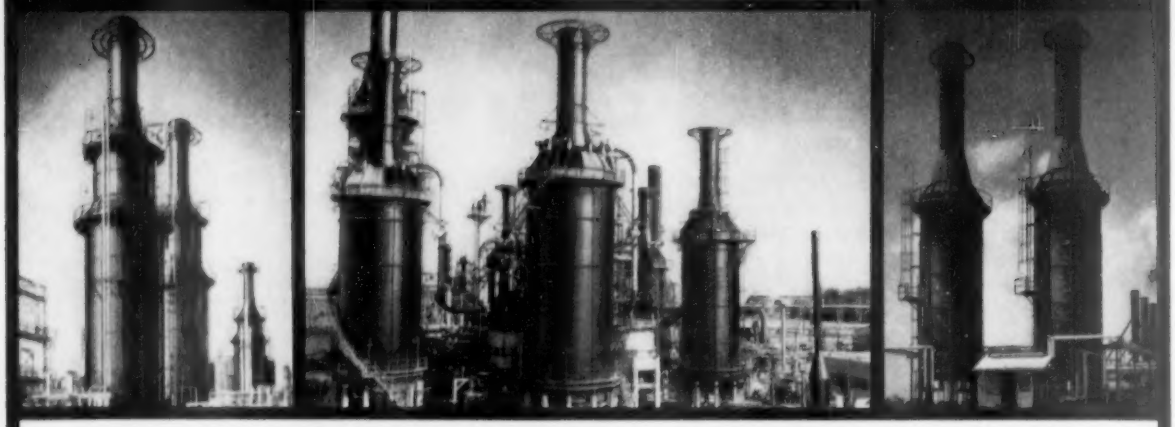

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TEXAS TODAY

arrangement with producers for processing their gas, and the accounting procedures entailed thereby.

When the idea of gathering together and processing the numerous small reserves along the Wilcox trend was first conceived, it was obvious that there must be two companies—the processor and the gatherer. Hence Goliad Corp. and Wilcox Trend Gathering System, Inc.

The gatherer purchases the gas. Goliad contracts for the recoverable components and for transportation of these components to main processing plant. Even with purchasing and transportation problems taken care of by others, we were still faced with the necessity of accounting for components recovered from each stream feeding the Wilcox plant.

As with any plant, the basic accounting problem is to determine the number of gallons derived from any gas stream processed and the value thereof. In the Wilcox plant determination of the amounts and kinds of products taken from each individual owner's gas is based on the amount of gas measured through each of Wilcox Trend's purchase meters, and a charcoal adsorption test made periodically of that gas. Table 1 shows the steps involved.

Step 1 in solving the accounting problem is to find the number of test gallons applicable to each stream. This is done by multiplying the gallons per thousand, as determined by the charcoal test, by the amount of gas processed. After the test gallons are determined for each stream, they are summed up. Then the percentage of test gallons of each stream in relation to the total test gallons is found. This percentage thus determined is multiplied by the total plant production to get the total number of gallons allocable to that particular stream. The value of products produced from the stream is calculated by multiplying the average netback price to the plant by the number of allocated gallons.

The ratio of test gallons of any particular stream to the total test gallons of all streams (calculation previously explained) is multiplied by the total fuel and shrinkage to determine the amount of fuel and shrinkage allocable to that stream.

Accounting at other plants . . . There were some accounting problems at Kittie, Clayton, and Hagist, too. The processing contracts pertaining to Kittie provide that settlement to the producers shall be based on the amount of products produced and sold during the month plus an estimate of the value to be received for products produced during the month, but which are not sold. Therefore, one might say, the contracts are based on sale of products. Yet, because we have to treat the products not sold and in inventory at the end of the month as sales, for all practical purposes settlement is made on net production.

Inasmuch as settlement must be made for gas processed belonging to different owners, it becomes necessary that we determine the amount, kind, and value of products allocable to each owner's gas.

The basic products produced are propane, a mixture of iso and normal butane, and 16-lb. natural gasoline. A mixture of propane and iso-normal butane mixture is also sold.

Basic data needed to account for the products produced and sold are (1) net plant production, i.e., gross production of the plant minus loading, blending, and transfer losses, (2) average net price received for each gallon of product sold, and (3) Podbielniak analysis of each gas stream being processed.

The first step in determining the products allocable to each stream is to convert the various products sold to components comparable to those found in a typical Pod analysis. This is accomplished by: (1) segregating the amounts of propane and iso and normal butane which was used to make L.P.G. mixture, to propane and iso-normal butane. By analysis the mixture contained 80 per cent butane and 20 per cent propane; the percentages 80 and 20 are applied to the 150,000 gal. of mixture made to obtain the split of components, (2) also by analysis the 16-lb. natural gasoline contains 15 per cent butane. This per cent is applied to the total of 433,330 gal. of natural gasoline produced and the result is added back to the iso and normal butane total as shown in Table 2.

Allocation by streams . . . Having thus obtained the production by components, we are now ready to make the allocation of these components to the various gas streams processed. We first multiply the total amount of gas produced by the percentage as shown by the Pod analysis of the component contained in that particular gas, as shown in Table 3. The result is the theoretical amount of that component contained

TABLE 4—KITTIE-CLAYTON-HAGIST ALLOCATION OF COMPONENTS TO PRODUCTS
(In gallons)

	Stream A	Stream B	Stream C	Total
Propane allocable to stream*	405,000	207,000	288,000	900,000
Less propane used in L.P.G. mixture	9,300	7,913	12,787	30,000
Total propane sold	395,700	199,087	275,213	870,000
Iso and normal butane allocable to stream*	248,000	224,000	328,000	800,000
Less iso and normal butane sold	190,650	172,200	252,150	615,000
Total allocable to L.P.G. mix and gasoline	57,350	51,800	75,850	185,000
Less amount used in gasoline	20,150	20,150	24,700	65,000
Total iso and normal butane used in L.P.G. mix	37,200	31,650	51,150	120,000
Plus propane used in L.P.G. mix	9,300	7,913	12,787	30,000
Total L.P.G. mix sold	46,500	39,563	63,937	150,000
Pentanes plus allocable to stream*	114,180	114,180	139,970	368,330
Plus iso and normal butane	20,150	20,150	24,700	65,000
Total gasoline sold	134,330	134,330	164,670	433,330

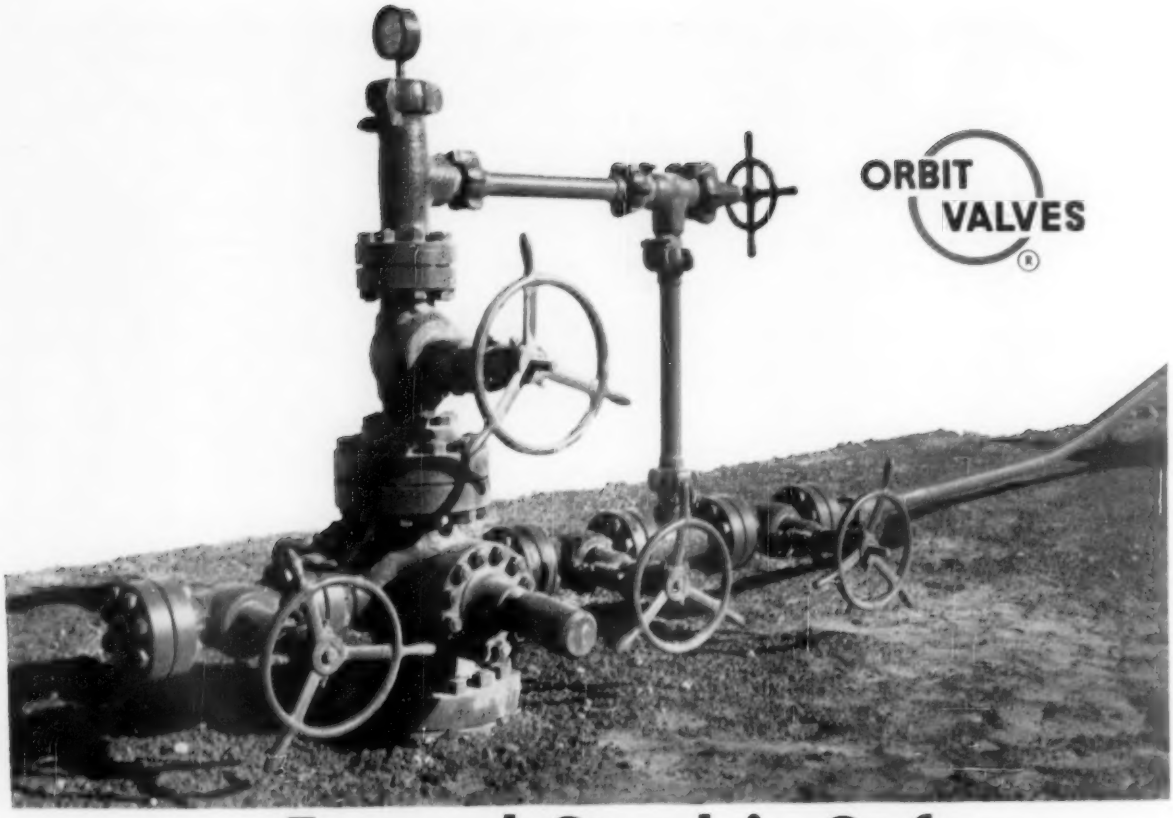
*Figures taken from Table 3.

TABLE 5—KITTIE-CLAYTON-HAGIST CALCULATION OF THEORETICAL RESIDUE GAS, FUEL, SHRINKAGE AND DELIVERIES TO PIPELINES

	Gas delivered to plant in M.c.f.	Theoretical residue gas* (M.c.f.)	Per cent of total theor. res. gas	Deliveries to pipelines (M.c.f.)	Shrinkage and fuel used (M.c.f.)
Stream A	900,000	873,000	41	877,400	22,600
Stream B	600,000	582,000	27	577,800	22,200
Stream C	700,000	679,000	32	684,000	15,200
Total	2,200,000	2,134,000	100	2,140,000	60,000

	Stream A	Stream B	Stream C	Total
Total gas processed	900,000	600,000	700,000	2,200,000
Less 3 per cent of volume processed	27,000	18,000	21,000	66,000
Theoretical residue gas	873,00	582,000	679,000	2,134,000

*Calculation of theoretical residue gas.



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in the gas. This procedure is followed for each stream of gas processed. We then sum up the total theoretical gallons and determine the percentage that the amount of each stream bears to the total. Each stream's percentage is then multiplied by the total components produced to find the amount of production applicable to that stream. This same procedure is followed for each component.

The next procedure is to allocate the components produced from each stream, to products produced and sold. An example is given in Table 4. We know by analysis that the natural gasoline produced is composed of 85 per cent pentanes plus and 15 per cent butane; therefore, by dividing the amount of pentanes plus in a stream into 85 per cent, the total amount of natural gasoline allocable to that stream is obtained. By subtracting the pentanes plus from the total thus obtained, we arrive at the amount of butane. This amount of butane is then subtracted from the total iso and normal butane components.

The result is the amount sold as a mixture and the amount which was mixed with propane to obtain the L.P.G. mixture sold. We have previously determined by analysis that the L.P.G. mix is composed of 80 per cent butane and 20 per cent propane. By dividing the amount obtained above by 80 per cent, we arrive at the total amount of L.P.G. mix. Then by subtracting the amount of butane from the total L.P.G. mix, the amount of propane applicable to the mix is found. This amount is then subtracted from the propane to obtain the actual amount of propane production.

Having obtained the amounts and kinds of products produced and sold, applicable to a particular stream, it is a simple matter to determine the value. This is done merely by multiplying the average price received for each product by the number of gallons of that particular product. The resulting figures are added to find the total value.

Although all of the residue gas is delivered to a single transmission line, the fact that several different owners' gas is processed presents a problem in determining the amount of residue gas applicable to each gas stream. This problem is solved by computing the amount of theoretical residue gas attributable to each stream, and using this as a basis for the allocation of the actual amount of gas delivered to the pipeline. The theoretical residue gas for any stream is determined by subtracting from the total gas delivered to the plant, an amount equal to 0.03 times the gas delivered. After this figure is determined for each stream processed, the percentage of each gas stream is determined in relation to the total theoretical residue gas. The resulting percentage is then applied to the gas delivered to determine the amount of residue gas applicable to any particular stream.

Acknowledgments

I would like to gratefully acknowledge the assistance of W. A. Bevans, of Goliad Corp., and E. H. Elmendorf, of Gasoline Plant Construction Corp., in preparing this paper.

BOOK

HYDRAULIC PUMPING. By Emory N. Kemler. Published by Summary Reports, P.O. Box 176, Spring Park, Minn. 320 pp., $15.

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* *"Research means you do not know but are willing to find out"* —CHARLES KETTERING

by O. C. Blade

Here's the 1954 Production Survey for Aviation Fuels

PROPERTIES of commercial-aviation gasolines and of aviation jet fuels are given here for 1953 and 1954. These data are taken from the 1955 Bureau of Mines report.[1] In this report, comparison is also made with previous years back to 1951. Earlier summaries as carried in The Oil and Gas Journal are included in the reference list.

With the exception of TEL content, characteristics of commercial aviation gasolines have not varied greatly over the period 1952-1954, inclusive.

Data for JP-3 and JP-4 aviation jet fuels was supplied by 15 manufacturers. Tests were conducted in company laboratories by A.S.T.M. procedures and in accordance with MIL-F-5624B and MIL-F-5161C.

References

1. U. S. Bureau of Mines, R. I. 5132, April 1955. Annual Survey of Aviation Gasoline and Aviation Jet Fuel, 1954 Production.
2. Jet-Fuel Symposium — The Oil and Gas Journal, October 6, 1952, pp. 93 ff.
3. Jet Fuels-Military; The Oil and Gas Journal, January 5, 1953, p. 85.
4. More on Military Jet Fuels; The Oil and Gas Journal, January 12, 1953, p. 119.
5. Annual Survey, Aviation Fuels—1952 Production; The Oil and Gas Journal, July 6, 1953, p. 95.
6. Military Specification, Fuel, Aircraft Turbine, and Jet Engine, Grades JP-3, JP-4, and JP-5, MIL-F-5624B, December 7, 1953, 6 pp.; and Amendment 1, March 18, 1954, 1 p., superseding MIL-F-5624A and MIL-F-7914(Aer).
7. Military Specification, Fuel, Referee, Aircraft Turbine and Jet Engine, MIL-F-5161C, December 4, 1953, superseding MIL-F-5161B.

Author is petroleum chemist, U. S. Bureau of Mines at Bartlesville, Okla.

TABLE 1—COMPARISON OF SOME AVERAGE DATA FOR COMMERCIAL-AVIATION GASOLINES

	Grade 80/87		Grade 91/96		Grade 100/130		Grade 108/135		Grade 115/145	
Test—	1953	1954	1953	1954	1953	1954	1953	1954	1953	1954
Octane number:										
Lean mixture	81.8	81.8	92.5	93.1	Iso+ 0.15	Iso+ 0.19	Iso+ 0.34	Iso+ 0.32	Iso+ 0.59	Iso+ 0.64
Rich mixture	87.7	87.9	98.4	98.6	Iso+ 1.35	Iso+ 1.35	Iso+ 1.76	Iso+ 1.75	Iso+ 2.88	Iso+ 2.92
Tetraethyl lead, ml./gal.	0.52	0.43	3.96	3.78	4.05	3.81	2.99	3.10	4.56	4.51
Performance number:										
Lean mixture					106	107	111	111	118	119
Rich mixture					131	131	136	136	146	146
R.v.p., lb.	6.4	6.5	6.6	6.4	6.6	6.6	6.6	6.6	6.5	6.6
D86 dist. temp., °F.:										
10 per cent evap.	148	147	148	147	148	146	148	146	148	147
50 per cent evap.	191	192	192	192	204	204	212	215	212	212
90 per cent evap.	237	234	236	233	246	245	246	251	246	245
Slope at 10 per cent evap.	1.6	1.7	1.8	1.7	2.1	2.1	2.4	2.3	2.4	2.5
Visc., kinematic, 70° F., cs.	0.609	0.619	0.616	0.608	0.627	0.632	0.643	0.634	0.637	0.633

TABLE 2—SUMMARIZED DATA ON AVIATION JET FUELS

	Grade JP-3			Grade JP-4		Referee JP-4		Grade JP-5		
Inspection test—	1953		1954	1953	1954	1953	1954	1953	1954	
Number of fuels		*2	4	28	23	1	1	1		*2
Gravity, °A.P.I.	55.6	50.7	56.5	51.8	51.5	45.4	48.1	37.3	37.8	41.0
Distillation temp., °F.:										
10 per cent evap.	165	194	160	220	216	240	244	397	384	395
50 per cent evap.	301	340	265	324	319	349	361	432	418	424
90 per cent evap.	446	426	421	421	425	461	457	491	470	480
400° F. point—per cent evap.			84		82.5		72.0		27.5	16
Reid vapor pressure, lb.	5.7	5.5	5.7	2.5	2.6	2.2	2.5	0.5	0	
Freezing point, °F.	<—76	<—76	<—76	<—76	<—76	<—76	<—76	—54	<—40	—59
Viscosity, kinematic, —40° F., cs.		3.26	2.15	3.68	3.26	3.80	3.41	19.4	12.1	13.36
Water tolerance, ml.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aniline point, °F.	132.9	124	130.5	134.8	133.8	106.5	131.4	136	129	146
Aniline-gravity constant	7,389	6,287	7,373	6,983	6,891	4,835	6,320	5,073	4,876	5,986
Bromine No., gm. Br. 100 gm.	1.52	1.54	1.06	1.63	1.59	19.6	5.60	4.3	3.7	0.80
Sulfur:										
Total, wt. per cent	0.077	0.048	0.089	0.074	0.080	0.265	0.177	0.46	0.33	0.075
Mercaptan	0.003	0.001	0.001	0.0014	0.0016	0.002	0.001	0.003	0.001	0.001
Aromatic content, vol. per cent	12.3	16.0	10.3	11.9	11.3	20.3	16.4	8.3	20.3	15.13
Olefin content			0.6		1.3		2.3		0.9	0.87
Smoke point			29.4		28.7		23		21	21
Smoke volatility index			64.7		63.4		53.2		33	27.7
Gum:										
Existent:										
Air-jet, 400° F.—mg./100 ml.	0.7	0.4	1.6	1.3	1.3	2.8	1.4	3	2	
Steam-jet, 450° F.		0.4	1.5	0.7	0.6		1.0	2	1	1.0
Accelerated:										
Air-jet, 400° F.	1.5	2.9	1.8	2.9		13.4	14.5	5	2	
Steam-jet, 450° F.		2.4	1.9	1.7	2.5		9.3	4	1	1.0
Heat of combustion, net—B.t.u./lb.	18,716	18,555	18,715	18,714	18,678	18,467	18,582	18,474	18,391	18,569
Hydrogen-carbon ratio		0.1575	0.1680	0.1649	0.1635		0.162	0.159	0.157	0.151

*As only two samples are represented, average values were not computed.

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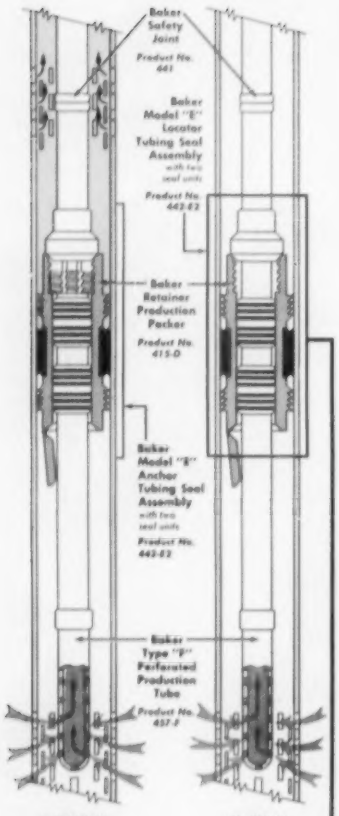
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JOB IMPROVEMENT FOR THE PROCESS FOREMAN—8

How Design Factors Affect Heat-Exchanger Efficiency

LET'S continue the analysis of basic heat-exchanger information that we began in the last installment, June 6. Then we discussed the process information a good specification should have. Now let's look at . . .

. . . **Mechanical information.** The heat-exchanger inquiry should specify these mechanical features: the tube size, tube gage, and tube length; the minimum design pressure and temperature; the corrosion allowance, if any; the pressure vessel code and any special codes involved; the desired tube field layout and pitch; the nozzle size and facing, if there is a preference; and the materials of construction for both the shell side and tube side.

When special materials are required, it is well to give the reasons for their choice. Based on his experience, the manufacturer may point out difficulties with the specified material and suggest alternatives. Specifying these mechanical features is necessary if the bids from manufacturers are to be comparable.

Q. What's an example of how a variation in one design feature can affect cost?

A. Let's take a look at the effect of varying the tube size. There are three common tube sizes for heat exchangers. They are ⅝, ¾, and 1 in. Exchangers with ⅝-in. tubes are the least expensive in cost per square foot of surface because the given surface fits into a smaller shell diameter. But the ⅝-in. tubes are more difficult to clean than larger tubes.

Higher maintenance may soon eat up the difference in exchanger first cost. The ¾-in. tubes are much easier to clean. Except for conditions of severe fouling, ¾-in. tubes are usually the most economic in the long run. When the intube fluid is known to be very fouling, and when frequent cleaning is anticipated, the tubes may be 1 in. or larger. The heat-exchanger manufacturer is not in as good a position to judge the fouling tendencies as is the operator. Therefore, the buyer should always specify the tube size in the inquiry.

Q. What are the most important factors to consider in process design of heat exchangers?

A. Industry has come a long way in solving the mysteries of heat transfer, but still has a great deal to learn. Heat transfer in tubes in the turbulent region is pretty well tied down. Almost any textbook shows a good method for computing heat transfer in tubes for turbulent flow. But heat transfer in tubes in the laminar region, or heat transfer in the shell in both the laminar and turbulent region, is virtually impossible to get from the literature. Many articles discuss these phases of heat transfer. Most of them show good correlations for individual sets of data. But cross-plotting data from various investigations results in contradictions and confusion. In addition, heat transfer for condensers and reboilers is not very well covered by the literature. As a result, the designers and manufacturers of heat-transfer equipment must devise their own methods.

. . . **Shell-side factors.** Most shell-and-tube exchangers are equipped with cross baffles. The cross baffles support the tubes and direct the flow of the shell-side fluid across the tubes. In-shell transfer rates are difficult to predict. They can vary widely with bypassing caused by manufacturing methods and tolerances.

The shell-side fluid can partially bypass the tube bundle through three areas.

One of these areas is the clearance area between the tubes and tube holes in the cross baffles. Another is the clearance area between the cross baffles and the shell. The third is the area between the outermost tubes and the shell. These various bypass areas are shown in the sketch in Fig. 1.

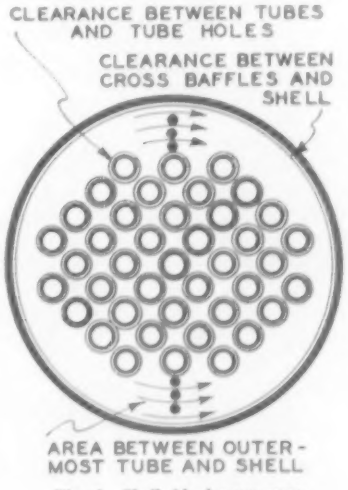
CLEARANCE BETWEEN TUBES AND TUBE HOLES
CLEARANCE BETWEEN CROSS BAFFLES AND SHELL
AREA BETWEEN OUTER-MOST TUBE AND SHELL

Fig. 1—Shell-side bypass area.

The bypass quantity is affected not only by these design clearances, but by the manufacturing tolerances on shell roundness, baffle diameter, and tube-hole clearance.

. . . **Fouling factor.** Almost all exchangers are designed with an allowance for fouling. Ideally, this allowance represents a service factor. During operation a dirt film gradually builds up on the tube surfaces. The dirt may be rust, boiler scale, silt, coke, or any of a number of things. In effect, fouling factor represents additional surface to offset the decrease in heat-transfer rate caused by the dirt deposit.

. . . **Ignorance factor.** We say that ideally the fouling factor represents a service factor. Actually it covers other unknowns that the manufacturer cannot evaluate. And it may cover any loss in heat-transfer rate caused by poor design and loose manufacturing tolerances. Let's take an example to show what this can mean.

Say we have an oil cooler designed with a service-transfer rate of 65 and a fouling factor of 0.004. The exchanger has about 40 per cent more surface than computed by theory for the clean condition. If the exchanger is poorly manufactured, half of this extra surface might be needed to offset the loss in heat transfer. Only half of the extra surface then remains available as true fouling factor to allow for dirt deposit.

This material is from a paper, "Design Features in Heat Exchangers," by W. E. Glausser and J. A. Cortright, C. F. Braun & Co., Alhambra, Calif. Paper presented at annual meeting, A.S.M.E., New York.

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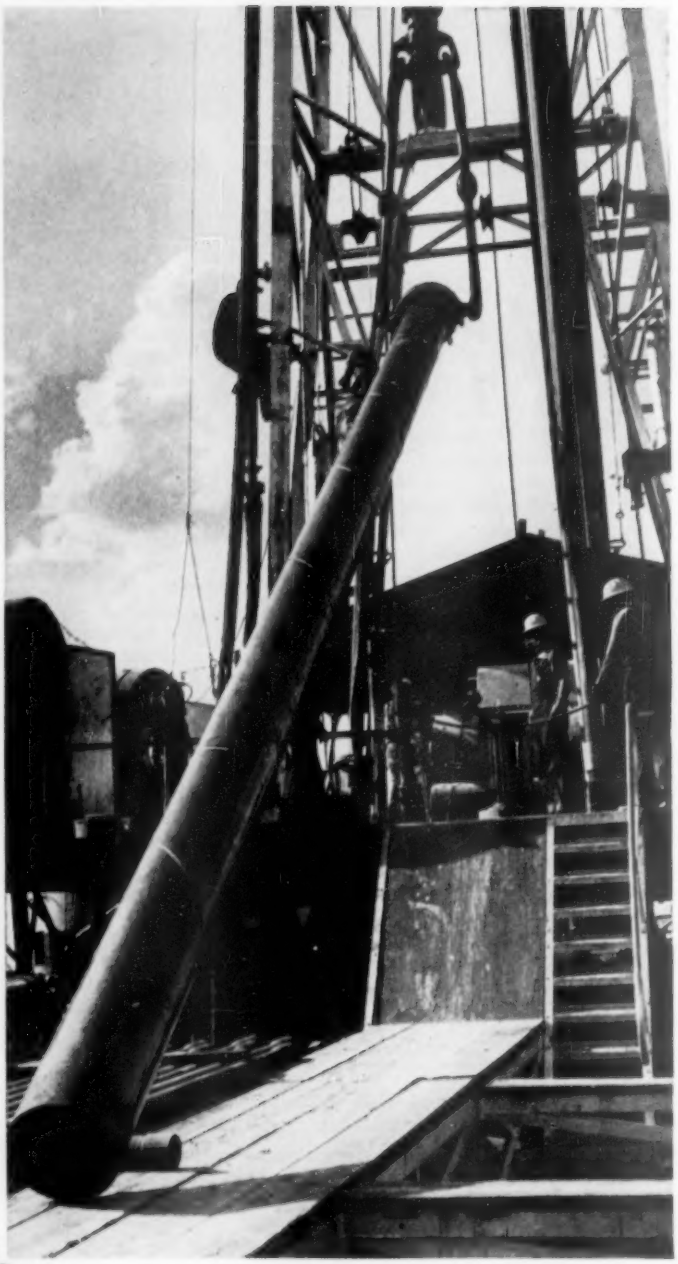

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Houston Contractor Has Canadian Offshore Contract

Two barges, one equipped with a rotary rig and the other carrying other necessary equipment, were in Lake Huron late in May, nearing their ultimate destination offshore in Lake St. Clair on the Canadian side. The Lake St. Clair Gas Co. will drill several offshore units. Contractor is R. L. Strader of Houston.

It is believed that the Niagara (Silurian) will be the ultimate objective of these tests. The barges with rig mounted (reported to be a Brewster N-4) entered the Mississippi River at New Orleans, moved north to Chicago through the Chicago River canal, and then into Lake Michigan, and via the Great Lakes to the western side of the Province of Ontario. Barges laid over in Chicago for several days for additional equipping en route.

Brazell & Wrather will drill for Elpasgar Oil Co. at 1 U.P.-Panhandle, a new wildcat operation 14 miles west of Harrisburg, in Banner County, southwestern Nebraska. Location is in 3-18n-56w.

The American Association of Oilwell Drilling Contractors awarded **Dr. Charles F. Weinaug** of the University of Kansas a plaque and an honorarium of $400 in May for outstanding work in encouraging men to enter the drilling industry on a career basis. The presentations were made by **Lloyd Pickrell** of Pickrell Drilling Co. Dr. Weinaug is chairman of the Department of Petroleum Engineering at the University of Kansas School of Engineering and Architecture.

Milam Drilling Co., San Antonio, is drilling on a contract with Anderson & Martin at a wildcat location 7 miles southwest of Charlotte, in western Atascosa County, Southwest Texas.

J. I. Roberts Drilling Co. has contract for a deep Claiborne Parish, North Central Louisiana wildcat for Skelly Oil Co. The 1 J. H. Owens will be put down to 10,500 ft. or the Smackover 1½ miles east of East Haynesville-Smackover field. The wildcat is also about 3½ miles west of Colquitt field.

Woolf & Magee Drilling Co. are drilling a new Wilkinson County, Mississippi, wildcat, 2½ miles southeast of Wilkinson for Serio-Punches Oil Co. and Thomas J. Glennon. The 1 Wheatstone is in 31-3n-1w. The wildcat is due to test the Wilcox sand at 8,000 ft.

Mesa Drilling Co., Denver, will drill a 3,600-ft. Entrada test for American Metals Co. at a wildcat location, 1 Frontier, in the West Bar-X area, Grand County, Utah. Location is in 22-17s-25e.

B. M. Crooks has contract for a shallow wildcat in LaSalle Parish, East Central Louisiana. The 1 Mrs. E. J. Whatley Estate, SW NW 8-6n-3e, is 1⅜

Tom Jack, owner of Tom Jack Drilling Co., Ardmore, Okla., on the 1 Ellsworth, a well being drilled for Arthur P. Ramsey in the East Hoover field, 7 miles west of Davis in Garvin County's Wild Horse bottoms. (Left to right) Oscar Lawrence, floorman; Pete Runyan, floorman; Bruce Oats, derrickman; Cody Caldwell, driller, and Tom Jack.

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Exploration Drilling Co. has contract to drill a 4,300-ft. Otter test for Amerada Petroleum Corp. in the West Melstone area of Musselshell County, Montana. It will be the 1 Northern Pacific "E," SE NW 3-10n-28e, 10 miles northwest of Melstone. Rotary tools are moving in.

Larco Drilling Co. has contract for a 10,200-ft. north offset to the Bolton field discovery well in Hinds County, Mississippi. The well, Jett-Larco 1 Roberts-Campbell Unit, C SW SE SW 18-6n-2w, is also an east offset to another active well.

Empire States Drilling Co. is drilling contractor for a wildcat in Rio Arriba County, San Juan basin, New Mexico. It is for Pacific Northwest Pipeline Co. The well, 1 Indian "F," will be located in SE NW NW 4-28n-3w. Drilling is under way below 945 ft.

Alyward Drilling Co. tools will drill a wildcat for Aurora Gasoline Co. in Kingman County, Kansas. The 1 Rohlman, SE SE NW 18-29s-8w, is in the Sedgwick basin of South Central Kansas. It is 2 miles east of Willowdale field production.

Musgrove Petroleum Co. tools are drilling a Beaver County, Oklahoma Panhandle test for Jocelyn-Varn Oil Co. of Wichita. The 1 Boileaus, SE SE NW 27-3n-20eCM, will test the Chester-Mississippian at 7,300 ft.

B. F. Allison has contract for a wildcat to be drilled in El Paso County, Colorado. The test will be for Sinclair Oil & Gas Co. at 1 Anderson, C SE NE 14-12s-62w. The wildcat is located 3 miles south of Celhan.

Penrod Drilling Co. has contract for a rank wildcat in Crowley County, Colorado. It is N. B. Hunt 1 Town of Fowler et al., C SE SW 33-21s-59w, 16 miles southwest of Ordway, Colo. The test will be drilled as a tight hole.

Brazell & Wrather have contract for a 10,200-ft. Cambrian test in Carbon County, Wyoming. The wildcat is Otis Roberts and C. Philip Wagner 1 Government, C NW SW 29-27n-89w, 3 miles northeast of Lost Soldier field.

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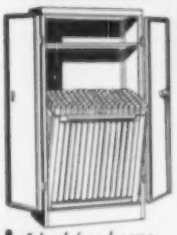

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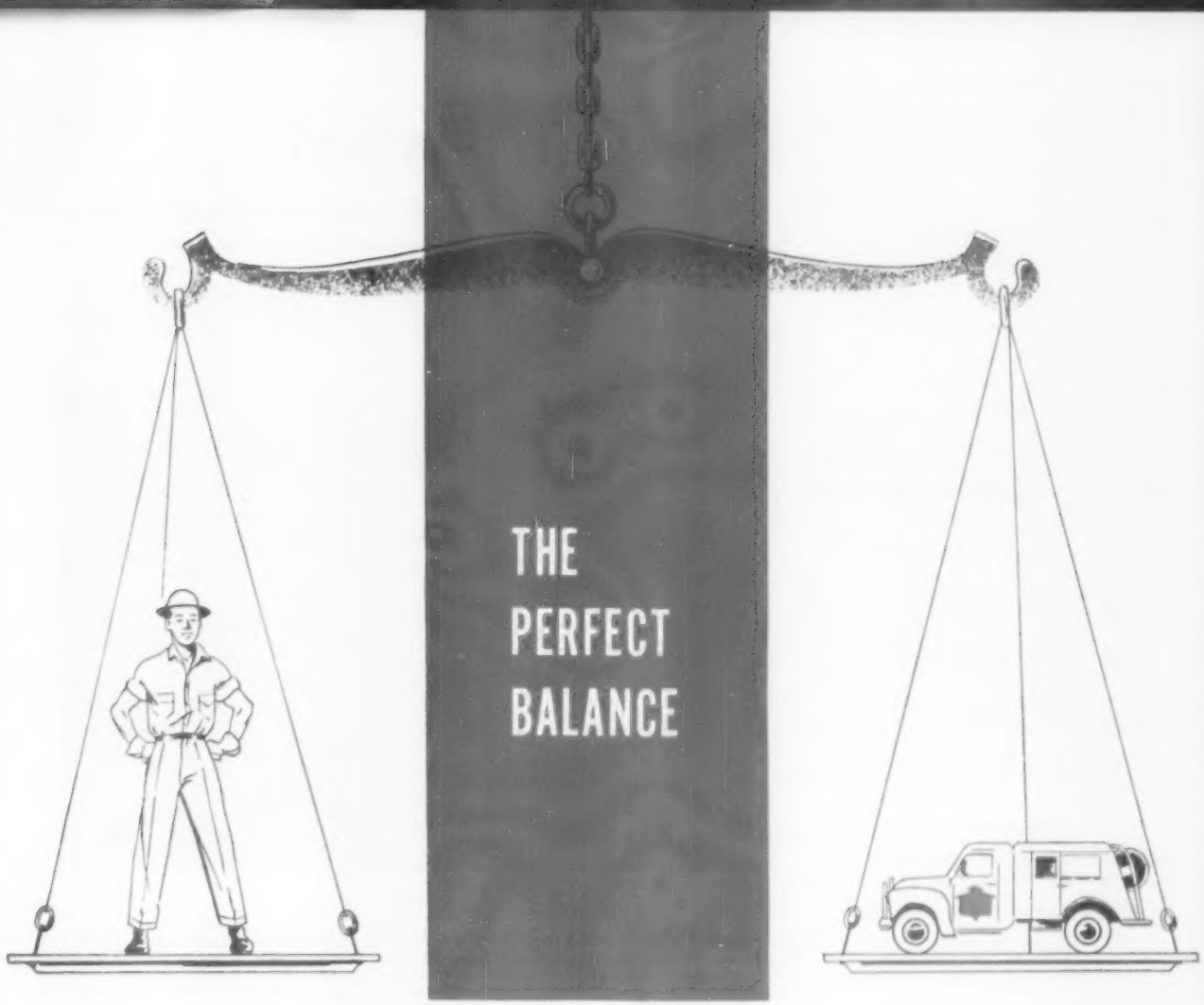

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. . . Report on Construction

Old Man River Just Keeps Rollin' Along

The hardy pipeliners who started down this hill laying their natural-gas lines probably felt somewhat different than Ferdinand DeSoto did some 300-odd years ago when he first gazed on the mighty Father of Waters. However, the watery obstacle he presents has been conquered many times by pipeliners in the past and doubtless will be many more times in the future. The picture was taken on a job being built by Panhandle Eastern Pipe Line Co.

Under Way, Contracted, and Planned

PIPELINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by • preceding the job.

Crude-Oil Pipelines

Ar-Mex Pipe Line Co.—Company has applications for two lines before the Office of Defense Mobilization Board for rapid amortization approval.

1. A crude-oil line from Albuquerque, N. M., to Phoenix, Ariz. This line would serve a 20,000-bbl. refinery being planned by Frost & Associates of Dallas.

2. A crude-oil line from Guernsey, Wyo., to Albuquerque.

• **Big Horn Pipe Line Co.**—Firm has asked Wyoming Public Service Commission for permission to build a 150-mile, 8-in. crude-oil line from Ash Creek field, Wyoming, to a connection with Service Pipe Line Co.'s line at Midwest, Wyo.

• **Butte Pipe Line Corp.**—This joint venture of Shell Pipe Line Corp. and Murphy Corp. has announced plans for a 450-mile, 16-in. line from eastern Montana to Wyoming. The line will deliver to big-inch carriers which start in eastern Wyoming.

Magnolia Petroleum Co.—Company has let contracts on 215-mile, 12, 14, and 16-in. crude line from Midland to Corsicana, Tex. O. R. Burden Construction Corp. has the western half of the line and H. B. Zachry Co. has the eastern half. Work is scheduled to be finished by October.

Magnolia Petroleum Co. — This company will operate a 48-mile, 12-in. submarine pipeline for itself and Continental Oil Co., and Newmont Oil Co. The line will run to blocks off the coast of St. Mary's Parish, Louisiana, and will have a capacity of 50,000 bbl. per day. Brown & Root, Houston, has the contract and expects to be finished by the middle of 1955.

• **Malco Pipeline, Inc.**—Company is planning a 40-mile, 4-in. line from South Blanco Tocito field in Rio Arriba County, New Mexico, to Bloomfield, San Juan County, New Mexico. Completion set for 1955.

Standard Pipe Line Co.—Company plans to build two crude lines. Applications are now before the Office of Defense Mobilization for rapid amortization approval.

1. A 350-mile, 16-in. crude line from Glendive, Mont., to Guernsey, Wyo., to connect with Platte Pipe Line Co.'s system there.

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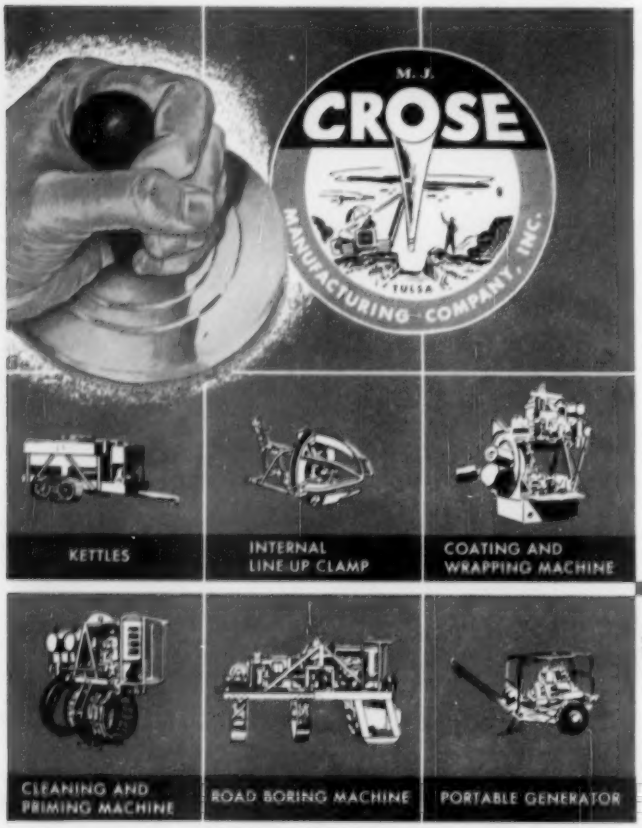

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Pipeline Patrol

2. A 330-mile, 16-in. crude line from Wink, Tex., to Albuquerque, N. M. This line would serve a 10,000-bbl. refinery being planned by Frost & Associates of Dallas.

• **Stanmount Pipeline Co.**—Company is seeking permission to build a crude-oil line from fields in North Dakota to Cromer, Man., where it would hook up with the Interprovincial line. The line would cost $6,000,000. Size not known.

Trans Mountain Pipe Line Co.—Engineers Limited Pipeline Co. has contract to lay 27 miles of 20-in. from Laurel to Burlington, Wash., and 9 miles of 16-in. of lateral to Shell Oil Co.'s new refinery at Anacortes, Wash. The $2,750,000 job will begin in spring and end July 31.

• **West Coast Pipeline Co.**—The off-again-on-again plans for this crude line from near Wink in West Texas to near Norwalk in California are presently before the Office of Defense Mobilization. A three-man board of nonindustry members recently recommended that the project be dropped. They questioned the ability of West Texas to produce enough crude to supply both the East and West Coasts in time of war. The three-man board favored building a line from California's Elk Hills Naval Reserve to be held in standby for possible future need.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

• **H. W. Bass & Sons, Inc.**—Company is planning on a 152-mile, 4-6-in. L.P.G. line from Goliad Corp.'s plant in Live Oak County, Texas, to Corpus Christi.

• **California - Oregon Pipe Line System.**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

• **International Pipe Line, Inc.**—132 miles, 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost: $4,200,000.

Moore Stoner Co.—Company has $2,500,000 tax amortization for a 200-mile, 6-in. products line from a connection with Oil Basin Pipe Line Co.'s terminal at Glendive, Mont., to Minot, N. D.

Okan Pipe Line Co.—This subsidiary of Warren Petroleum Corp. has awarded work to two contractors for its L.P.G. line from western Oklahoma and Kansas to Tulsa. Vaughn & Taylor Construction Co. has 260 miles of 3 to 6-in. gathering lines, and R. H. Fulton has 140 miles of 6-in. transmission line from western Oklahoma into Tulsa.

• **Products Pipe Line Co.**—This subsidiary of Goliad Corp. has received a fast writeoff for 40 per cent of $126,000 and 25 per cent on $1,781,000 for L.P.G. line from the Wilcox natural-gasoline plan in Lavaca County, Texas, to Texas City. Panama-Williams Co. has contract. Completion scheduled for midsummer.

Shell Pipe Line Corp.—65 miles of 12-in. products line from Baton Rouge, La., to Shell's Norco refinery. Houston Contracting Co. has contract. H. T. Muckley, Supt. Job to be completed in June.

Sioux Oil Co.—Company will build a 55-mile products, 8-in. line from its Newcastle, Wyo., refinery to Rapid City, S. D.

Southern Pacific Pipeline, Inc.—Company has let eastern sections of its 800-mile products line from Los Angeles and El Paso into Phoenix and Tucson. Morrison-Knudsen Co., Inc., and River Construction Co. have the 180-mile section between El Paso and Lordsburg, N. M. The remaining 150 miles into Tucson will be done by R. H. Fulton Co. The size of the line is 16-in. from Los Angeles to Colton, Calif., 12-in. from Colton to Phoenix, and 8 and 10-in. from El Paso to Tucson.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport L.P.G. from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Texas Eastern Transmission Corp.—Company has received Federal Power Commission approval to abandon the "Little Inch" gas line and to convert it to products service. The company will spend $13,000,000 converting the line back to products. When finished the line will have a capacity of 235,000 bbl. daily.

Natural-Gas Pipelines

• **Alabama-Tennessee Natural Gas Co.**—Company has proposal before FPC to lay 21 miles of 12-in. line west from its present line in Colbert County, Alabama.

• **American-Louisiana Pipe Line Co.**—1,121 miles of 30 and 22-in., 30-in., proposed, extends from North Tepetate, Acadia Parish, Louisiana, to near Detroit. The 22-in. starts near Payne, Ohio, extends to Bridgman, Mich. Estimated cost: $130,000,000. FPC approved.

• **Arkansas Louisiana Gas Co.**—136 miles of new line proposed, to be added to present system in Arkansas, Louisiana, and Texas. Estimated cost: $9,245,166. FPC approved.

Atlantic Seaboard Corp.—Company has received FPC authority to lay 84 miles of natural-gas line in West Virginia, Virginia, and Maryland. The 26-in. line will parallel existing lines between Cobb, W. Va., and Balti-

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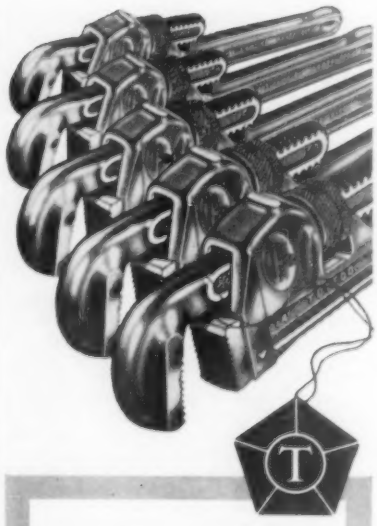

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more. The job will cost $9,281,500 and will include 2,000 hp. additional compressor capacity. Finish scheduled for this summer.

• **Carolina Natural Gas Corp.**—185 miles 2-12-in., proposed lateral lines off Transcontinental in North and South Carolina.

• **Central Hudson Gas & Electric Corp.**—Company has filed application with FPC to construct 48 miles of 12-in. line from Albany to Kingston, N. Y. Line will be started and completed in 1955 if FPC approves.

• **Cities Service Gas Co.**—Company has applied to the Federal Power Commission for permission to build a 93-mile, 26-in. natural-gas line from Blackwell, Okla., to Independence, Kans. The company also proposes to build a 145-mile gathering system in Woods County, Oklahoma, and Barber County, Kansas. The two jobs will cost $8,422,400.

• **Clinchfield Coal Corp.**—Company has filed permit with Federal Power Commission for authority to build 16-mile, 12-in. line from Dickenson County, Virginia, to near Osborne Gap, Ky. The company is primarily a coal producer.

• **Coastal Transmission Co.**—Company plans to build 550 miles of 30-in. line from near McAllen in South Texas to near Baton Rouge (See Houston, Texas Gas & Oil Co.)

Colorado Interstate Gas Co.—Company has let first part of its 380-mile, 22-in. line from Rock Springs, Wyo., to Denver to Houston Contracting Co. The construction firm is working on 126 miles from near Laramie, Wyo., to Denver. The line will pick up its gas from Pacific Northwest at Rock Springs.

Colorado Interstate Gas Co.—Company is also spending $4,200,000 extending its gathering lines in the Panhandle of Texas, Oklahoma, and Kansas. Work will be done this summer.

• **Colorado-Western Pipe Line Co.** — 454 miles of undetermined size pipe planned between Cortez in Montezuma County and Denver. Line would serve towns of Montrose, Gunnison, Salida, Fairplay, and South Platte, Colo. Estimated cost: $30,000,000. Company also plans 254 miles of laterals to service Colorado cities not now receiving natural gas.

328-mile line, proposed, to run from a point in La Plata County in southwestern Colorado over the Continental Divide along the eastern slope to serve Pueblo, Colorado Springs, and Denver. Estimated cost: $21,600,000.

East Ohio Gas Co.—Company has let contract to Williams Brothers Co. to lay 112 miles of 30-in. from Maumee, Ohio, to Cleveland. Completion is set for October 1.

• **El Paso Natural Gas Co.**—Company has three plans ready to present to the FPC to increase its California capacity. The preferred plan calls for the company to loop its 500-mile, 34-in. line from the San Juan basin to the California border. If this fails to win approval, the firm will offer to build a 30-in. line from Pacific Northwest's line at Mountain Home, Idaho, to the San Francisco area. Another plan is to build a 30-in. line from near Pendleton, Ore., into California. Company feels the looping program will be required even if one of the alternate plans would win approval.

Company has FPC approval for 74 miles of line and 6,925 hp. additional compressor power in Texas, New Mexico, and Arizona. The cost will be $13,869,013.

• **Hope Natural Gas Co.** — Proposing to build a 22½-mile extension of existing line from Boone County, West Virginia, to Logan-Mingo county line, West Virginia. Estimated cost: $930,000.

• **Houston, Texas Gas & Oil Co.**—Company plans to build 600 miles of 30-in., and 350 miles of 18-24-in. line to carry natural gas from Baton Rouge to Miami. Line will join with Coastal Transmission's proposed line from McAllen, Tex.

• **Kansas-Nebraska Natural Gas Co., Inc.**—Proposes to construct 206 miles of 6-12-in. pipeline to add to present system in central and northeastern Nebraska.

• **Lone Star Gas Co.**—Company has two plans up before FPC to enlarge its system in Texas and Oklahoma. One is for an $18,000,000, 230-mile line from Cotton County, Oklahoma, to Fritch, Tex. The other plan is for a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. The company hopes to prevent Natural Gas Pipeline Co. of America from building its line from Wise County, Texas, to Fritch (see below).

• **Lone Star Gas Co.**—Firm has applied to FPC for permission to build a 230-mile natural-gas line from Cotton County, Oklahoma, to Fritch, Tex. The line would deliver gas from Lone Star's connections in the Golden Trend fields in Oklahoma to Natural Gas Pipeline Co. of America at Fritch.

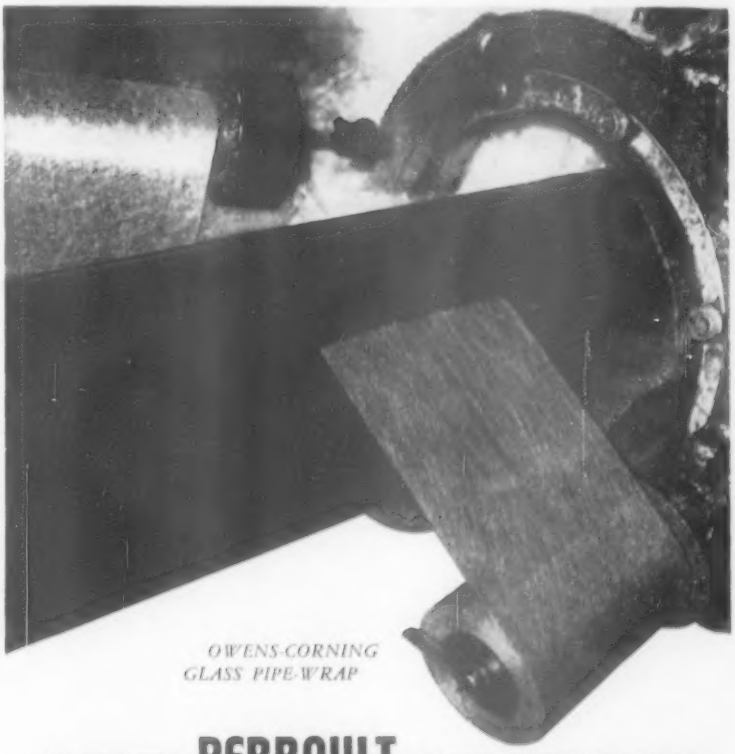
• **Michigan Consolidated Gas Co.** — 25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

• **Michigan Gas Storage Co.**—Company has applied to FPC for permission to construct 36 miles of 16-in. natural-gas line from Mount Pleasant Junction to Milwaukee, Mich. The project will cost approximately $2,572,000.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in. loops. Majority will be in Wisconsin.

• **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

• **Natural Gas Pipeline Co. of America.**—Company now before FPC on plans to build 350 miles of 20 and 26-in. line from Wise County, East Texas, to its station 111 at Fritch, Tex.



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• Company also plans to start 31 miles of 36-in. in July from Herscher, Ill., to a connection with Texas Illinois pipeline near Joliet, Ill. Job slated to be finished in November.

Natural Gas Producers, Inc.—Company has let contract to Houston Contracting Co. for 49 miles of natural-gas transmission line from northeastern Colorado to Denver, and 13 miles of distribution lines. The job will cost $1,374,000 and is expected to be completed in early July.

Nevada Natural Gas Co.—Company plans looping program along its 114-mile line from Needles, Calif., to Las Vegas, Nev. Mileage and size are unknown but cost will be about $2,500,000.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

• **New York State Natural Gas Corp.**—Company plans to start laying in June 18 miles of 20-in. pipe from Homer, Cortland County, New York, to its station in Otisco, Onondaga County, New York.

• Company also has plans for 21 miles of 20-in. from Genessee Falls, Wyoming County, New York to York, Livingston County, New York. No definite starting or completion dates announced.

• **Niagara Mohawk Power Corp.**—Company plans no major transmission lines for 1955. However, itp lans to add more than 300 miles of distribution mains.

• **North Indiana Fuel & Light Co.**—Company has awarded H. L. Gentry Construction Co. 30 miles of 10-in. and 15 miles of 6-in. natural-gas lines. Work will be completed near the middle of June.

• **Northern Natural Gas Co.**—Company has the following jobs before the FPC for approval.

• Canadian Extension—188 miles of 24-in. from Canadian border to near Wahpeton, N. D. 215 miles of 30-in. from Wahpeton to Farmington, Minn.

• South Dakota Extension—94 miles of 12-in. from Sioux Falls to Waterton-Huron. 71 miles of 10-in. from Waterton-Huron to Duluth-Superior.

• Duluth-Superior Extension—167 miles of 24-in. from Farmington to Duluth-Superior.

• Company has also asked FPC permission to build and operate $4,800,000 worth of pipeline facilities for use in testing an underground natural-gas storage field near Redfield, Iowa. The project would involve construction of 29 miles of 30-in. pipe.

Pacific Gas & Electric Co.—Company is working on 18 miles of 12-in. from Beehive Bend field to W/O Gridley in California. The job is slated for completion in September.

• Company plans 21 miles of 16-in. line from Marysville to Lincoln, Calif. Job will start in June and wind up in September.

• Company's long-range plans call for looping the Topock-Milpitas line with 135 miles of 34-in. The major part of the line will be laid in 1956, while 62 miles will be laid in 1957.

Pacific Northwest Pipe Line Corp.—Firm has let the initial contracts of its 1,466 miles gas line from the San Juan basin to Bellingham, Wash. The first contracts total $11,236,000. Contractors and their sections are:

River Construction Co., two sections totalling 150 miles of 26-in. between Ignacio, Colo., and Moab, Utah.

R. H. Fulton Co., two sections totalling 160 miles of 26-in. between Moab and Jensen, Utah.

Associated Pipeline Contractors, Inc., one section of 77.6 miles of 26-in. between Jensen and Green River, Wyo.

A. J. Curtis Construction Co., one section of 82.8 miles of 22-in. from Green River to Sage, Wyo.

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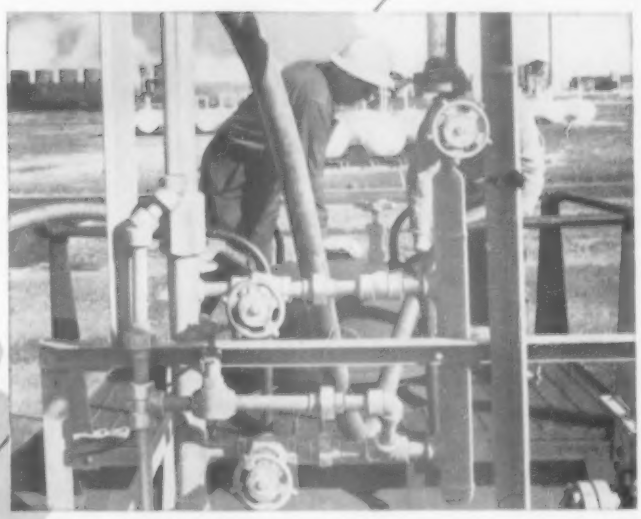

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Pipeline Patrol

B & M Construction Corp., one section of 90 miles of 22-in. between Sage and Lava Hot Springs, Idaho.

Midwestern Constructors, Inc., one section of 95 miles of 22-in. from Lava Hot Springs to Burley, Idaho.

• **Panhandle Eastern Pipe Line Co.**—Company has plans to loop Peoria lateral before FPC now. The line would be 16-in. pipe running 58 miles from near Springfield to Peoria, Ill.

• **Texas Eastern Pipe Line Co.**—Company plans to build 382 miles of 24-in. from Castor, La., to its main line at Kosciusko, Miss. This cross-over will enable the firm to move enough gas in the existing line from Kosciusko to Connellsville, Pa., to replace the Little Inch, which the firm hopes to convert to products. The FPC is hearing the conversion idea now. The conversion and the laying of the new line will cost approximately $71,000,000.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

Private Interests.—Proposes to build gas line from Gubik gas field near Navy Petroleum Reserve No. 4 in Alaska to Fairbanks. Line would be 450-mile, 8-in. line and Arctic Contractor, Inc., who handled engineering requirements and preliminary design, estimated the line would cost $20,000,000, although later figures have been much higher than this.

South Georgia Natural Gas Co.—Company has let contracts on work approved by the FPC in 1954. The total cost of the projects is nearly $9,000,000.

Buchanan Pipe Line Co. has 85 miles of 3, 6, and 8-in. line in the State of Georgia.

Hallmac Construction Co. has 97 miles of 10-in. line from Albany, Ga., to Ellaville, Fla.

Mid-States Construction Co. has 110 miles of 2, 4, 6, and 12-in. line in Alabama and Georgia. Seventy-one miles of the line is 12-in. from Phenix City, Ala., to Americus, Ga.

Thomason & Associates, of Montgomery, Ala., has 35 miles of 12-in. and about 8 miles of smaller in Alabama and Georgia.

Tennessee Gas Transmission Co.—Company has awarded Oklahoma Pipe Line Constructors 113 miles of 24-in. natural-gas line from near Covington to Laska-Waxen, Pa. The work has started.

Company has also awarded H. C. Price Co. 130 miles of 24 and 26-in. pipeline in Ohio and Pennsylvania.

• Company has also received FPC permission to construt a 30-in. line, 370 miles long from Agua Dulce, Tex., to Kinder, La. The line will cost $35,400,000.

• **Tennessee Gas Transmission Corp.**—Firm has requested FPC permission to spend $56,000,000 in new pipeline and compressor facilities. The work will include 221 miles of 26 and 30-in. loops in Kentucky and Ohio and 376 miles of gathering lines in Louisiana and Texas. Some 12,540 hp. would be added at new and existing compressor stations in Louisiana, Mississippi, and Texas.

Texas Eastern Transmission Corp.—Company has let 134 miles of 30-in. high-pressure natural-gas pipeline in the states of Mississippi and Louisiana to H. C. Price Co.

• Firm also has plans to build 382-mile, 24-in. line from Beaumont to Kosciusko, Miss., to replace the Little Inch line in moving natural gas. Cost will be $71,000,000.

Texas Gas Transmission Corp.—Company has big building program set to start soon and end approximately November 1.

From Covington, Ky., to Jefferstown, Ky., company will build 77 miles of 26-in.

Company will loop 14 miles of 20-in. at Haughton, La.

Will build 72 miles of 12-in. from Hardins-

burg, Ky., to Bedford, Ind. Also will build 5 miles of 8-in. near Bedford.

From Bastrop, La. to Clarksdale, Miss., the company will lay 50 miles of 30-in.

From Eunice, La., to Morgan City, La., the firm will lay 105 miles of 20 in.

Transcontinental Gas Pipe Line Corp.—Company has awarded the following contracts to lay 315 miles of 36-in. and 219 miles of 30-in.

O. R. Burden Construction Corp. will lay 5.31 miles of 36-in. and 25 miles of 30-in. in Louisiana.

Associated Pipe Line Contractors, Inc., will lay 63 miles of 36-in. in Louisiana and Mississippi and 71 miles of 30-in. in Virginia and Maryland.

Midwestern Constructors, Inc., will lay 14 miles of 30-in and 54 miles of 36-in. in Alabama and Georgia.

Western Constructors will lay 77 miles of 36-in. in Georgia and South Carolina.

Panama-Williams Co. will lay 36 miles of 30-in. and 31 miles of 36-in. in South Carolina and North Carolina.

Williams Brothers Co. will lay 72 miles of 30-in. in Virginia.

Transok Pipe Line Co.—Company has let contract to Pipe Line Service Co., Seminole, Okla., to lay a 140-mile, 24-in. line from Garvin County, Oklahoma, to Tulsa. The firm will also build a gathering system in the Bradley, West Lindsay, and Northwest Purdy fields.

• **Trunkline Gas Co.**—Firm has applied to FPC for authority to build eight new compressor stations and 24 miles of pipeline on its transmission system to enable it to sell additional gas to Panhandle Eastern Pipe Line Co. Total capacity of the new stations would be 56,000 hp. Total cost would be $18,700,000, including $1,000,000 for gathering facilities in the Gulf Coast area. Panhandle filed for 1,600 hp. additional compressor capacity to cost $3,714,000.

• **United Gas Pipe Line Co.**—Company has applied to FPC for permission to construct 63 miles of 16 and 20-in. natural-gas line in Mississippi, Alabama, and Florida. The company will also add 330 hp. to its compressor stations. Cost for the job will be about $8,300,000.

• **Utah Natural Gas Co.**—Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not yet let.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Wilcox Trend Gas Gathering System, Inc.—Company is spending over $1,000,000 building gas-gathering lines and compressor stations in the Cuero-Goliad area of South Texas.

Foreign Crude-Oil Pipelines

• **Atlas-Dresser.**—Included in this company's agreement with the Argentine Government are plans to build a 400-mile, 16-in. crude line from Plaza Huincul area to Bahio Blanca.

Bolivian Government—Williams Brothers has contract to build a 220-mile, 6-in. crude-products line from Cochabamba to Orura to La Paz. The line is described completely in The Oil and Gas Journal of May 16, 1955, page 136.

Canadian Gu'f Pipe Line Co.—Williams Brothers has contract to build 17 miles of 4-in. and 36 miles of 6-in. for this company from Clive and Joffre fields to its connections at Stettler.

• **Peace River Oil Pipe Line Co., Ltd.**—Company has been granted a permit to lay a 106-mile line from Sturgeon Lake field in Northwest Alberta to the Edson pumping station of Trans Mountain Oil Pipe Line Co., Ltd. The project will include a 16-in. line from Sturgeon Lake to Iosegun Lake and a

4-wheel drive does another job better!

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Here is the stop-at-nothing vehicle that travels right down the pipeline to take men and tools to the job regardless of terrain, or weather—the 4-wheel drive Universal 'Jeep'. It transports engineers and survey crews through roadless areas where ordinary vehicles can't go. It's a time-saver the year 'round. See your nearest Willys dealer or write for information.

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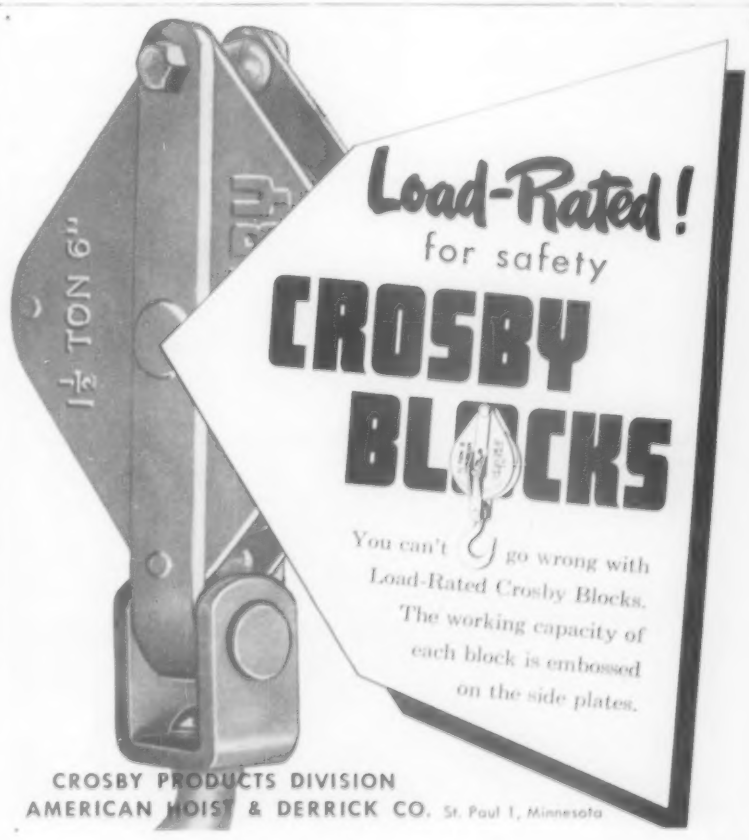
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BLOCKS
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Pipeline Patrol

12-in. line from there to Edson. Capacity will be 58,000 bbl. daily.

• **Petroleos Mexicanos.**—145 miles, 12-in. considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

• **Standard - Vacuum Oil Co.**—Company has long-range plans for a 90-mile pipeline to give the new Lirik field in Central Sumatra an outlet. Completion is not scheduled before 1957 or 1958.

• **Westspur Pipe Line Co.**—This company sponsored by Imperial Oil, Ltd., proposes to build a crude-oil line from southern Manitoba and Saskatchewan to a connection with the Interprovincial system running from Edmonton to Sarnia.

Yacimientos Petroliferos Fiscales Bolivianos—Williams Brothers has contract to build a 230-mile, 6-in. products line from Cochabamba-Oruro-La Paz. The line will cost approximately $7,000,000. The Bolivian Government will eventually add a 10-in. products line from Oruro to Arica, Chile.

• **Others.**—For plans for further crude lines in Canada that have not yet been fully formulated, see The Oil and Gas Journal, April 4, page 79.

Foreign Products Pipelines

• **Empresa Nacional del Petroleo.** — 80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of South Rhodesia and Portuguese East Africa.** — 200 miles, considered. Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

• **Iraq Petroleum Co., Ltd.**—Company is making plans to lay a 75-mile, 24-in. products line from Homs, Syria, to Tripoli, Lebanon. The line would have a capacity of 180,000 bbl. daily.

• **National Fuel Oil Co.**—This company in Israel is a shareholder in a company which plans to build a products line between Haifa and Tel Aviv. The plans call for a 55-mile 6-in. line in which the Government would own 10 per cent.

• **National Iranian Oil Co.** — Company plans $32,300,000, 573-miles, 10-in. products pipeline from Ahwaz to Teheran, Iran. The line will have a capacity of 40,000 bbl. daily. Costain-John Brown, Ltd., London, will build the 337-mile southern part. Entrepose, Paris, will build the northern 236 miles.

Oleoducto del Pacifico, S.A.—Company is building 100-mile, 6 and 8-in. products line from Buena Ventura to Cali, Colombia. Pipeline Engineering Co. of Dallas, Tex., has the engineering contract. Williams Brothers is laying the line.

U. S. Defense Department.—U. S. Defense Department is sponsoring a 485-mile, 8, 10, 12-in. products line from Cadiz to Zaragoza, Spain. The contract has been let to Merritt, Chapman & Scott; Benson & Root, of Oklahoma City; and Agroman Construction Co., a Spanish firm. Brown-Raymond-Walsh is the prime contractor. Cost of the line will be approximately $5,000,000.

Winnipeg & Central Gas Co.—Canadian company plans to build a $20 million butane-propane system. Company plans to get gas L.P.G. from Signal Oil & Gas Co.'s Tioga, N. D., plant and move it to Winnipeg. Size and route of the line has not been definitely established.

Foreign Natural-Gas Pipelines

Alberta Gas Trunk Line, Ltd.—This Canadian firm has let engineering contracts to two firms, Dutton, Williams Brothers, Ltd., and Mannix, Ltd., for a 300-mile, big inch gas-gathering system to collect Alberta's natural gas for transportation to Trans Canada Pipe Line Co.

• **Empresa Nacional del Petroleo.** — 80 miles, 10-in., planned, Concon to Santiago, Chile.

Saskatchewan Power Corp.—Company has let contract to Majestic Contractors, Ltd., Edmonton, for a 226-mile natural-gas pipeline from Coleville to Prince Albert. The line from Coleville to Saskatoon will be 116 miles of 14-in. From Saskatoon to Prince Albert, the line will include 40 miles of 12-in. and 70 miles of 10-in. Banister Construction, Ltd., has the distribution system for Prince Albert.

South Alberta Pipe Line, Ltd.—Company has filed permit to construct a 150-mile, 8-in. natural-gas line from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta. The line will cost about $1,000,000.

Trans-Canada Pipe Lines, Ltd.—Company has postponed start of 2,250 miles of 24-34-in. line from Alberta-Saskatchewan border to Toronto and Montreal until next year because of financing difficulties. Company also plans a 24-in. lateral from Winnipeg to Emerson, Man. Twenty-inch lateral from Niagra to Toronto now in operation. Plans for line to enter U. S. may be considered.

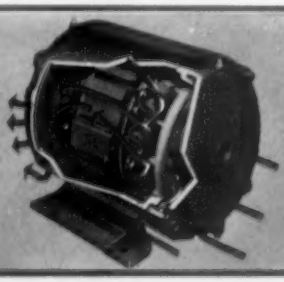
• **Westcoast Transmission Co., Ltd.**—Company has signed agreement with Pacific Northwest Pipeline Corp. and has revived plans for its line from the Peace River area of Alberta and British Columbia to the United States border near Sumas, Wash. Plans call for work to begin sometime this year. Company has also announced plans for a second line to parallel the first and to swing east into the Okanagan Valley.

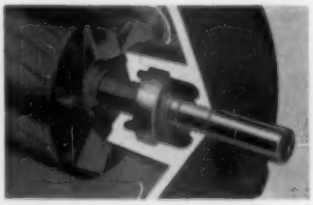
to PETROLEUM ENGINEERS, Howell suggests

What to look for in the new re-rated motors

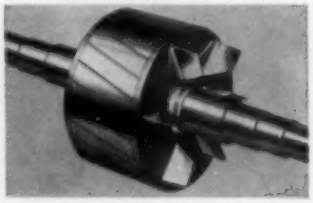
The space and weight saving advantages of the new NEMA re-rated frame sizes have been accomplished by various constructions. Prices may be the same . . . but why not insure getting the most for your investment. Below are some points for comparison . . . and a few of the reasons why Howell "Series 100" motors are so outstanding!

VENTILATION . . . "Cool running" means long life in motors. The steel shell of a Howell motor and a new stator design with the largest air passages yet devised put ample ventilation where it's needed. Compare!





BEARINGS . . . They should be fully protected. Dirt can't enter Howell's double shielded bearings either from inside or outside the motor, because they are sealed in the end plate cavities by dust-tight inner caps. Compare!



COPPER-CLAD ROTORS . . . Howell motors have copper-clad rotors. This means better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet your special requirements. Compare!

Above: Construction details of the new Series 100 Weather-Protected Motor. Left: the Totally Enclosed Fan-Cooled Motor.

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HIGH-TEST LINE PIPE

Cold expanded, electric-fusion-weld line pipe meeting API 5LX specifications, in diameters from 18 in. to 36 in. Available in 40-ft lengths and in wall thicknesses to ⅜ in. Bethlehem is also equipped to coat pipe exteriors and interiors.

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Pipe fabricated from alloy steels such as high-strength, low-alloy Bethlehem Mayari R steel plate (50,000 yield). This pipe is immediately available as rolled in 40-ft lengths and in wall thicknesses as required. All diameters from 18 in.

BETHLEHEM STEEL

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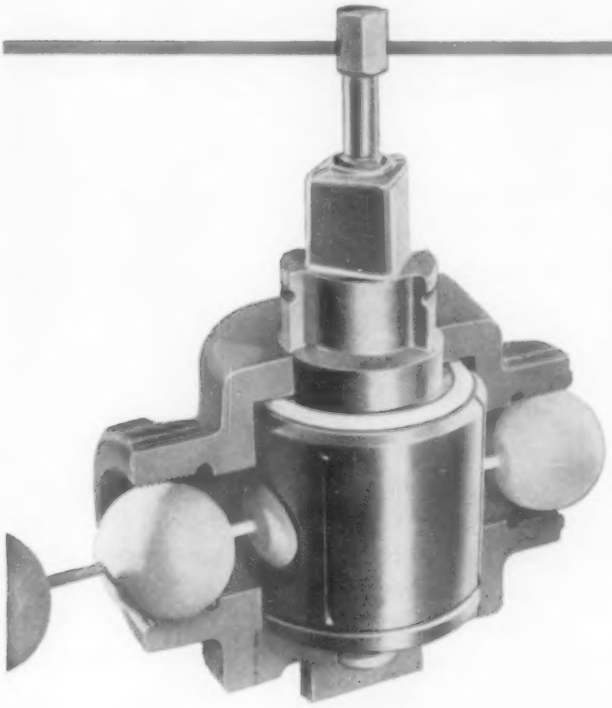
ROUND HOLES *FOR* ROUND PEGS



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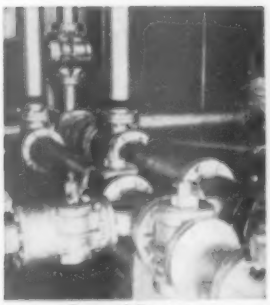
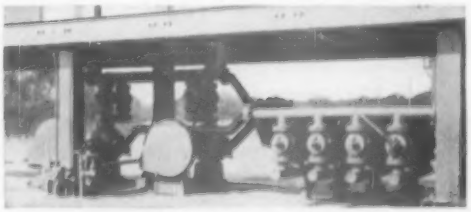
Remember, too, *both* acf Round Port Valves and Rectangular Port Valves feature quarter-turn shut-off . . . full pipe area opening . . . and non-wedging design. All together . . . these advantages add up to extra long, trouble-free service life that really *s-t-r-e-t-c-h-e-s* your maintenance budget. Representatives in 50 Principal Cities. Write for descriptive Catalog OG-6, acf Industries, Incorporated, Valve Division, 1501 E. Ferry Avenue, Detroit 11, Michigan.



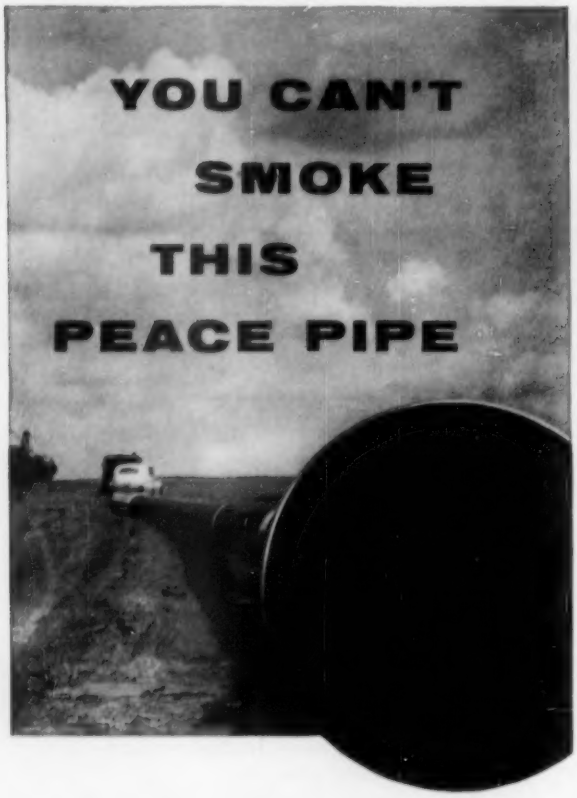
Proved Best on Raw Sewage Lines

On Chemical Plant Applications



In the Petroleum Industry

acf CYLINDRICAL FULL PIPE AREA **PLUG VALVES**



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These pipelines stand ready to serve all America's needs in time of danger...ready to speed millions of barrels of petroleum across the land wherever needed.

It is just one small example of the dynamic growth of one of America's largest oil companies. Cities Service invested over $60,000,000 in the never-ending search for and production of oil during 1954...refinery facilities were modernized and expanded at East Chicago and Lake Charles, Louisiana to make possible even better high-grade petroleum products...and four new supertankers were completed, bringing to 27 the total of Cities Service ocean-going vessels.

These are but a few of many improvements and enlargements in Cities Service operations...some for competitive advantage, some for cooperation with the entire industry and the government. They clearly reflect the progress that can be made in a business society whose members know that competition and cooperation are not incompatible.

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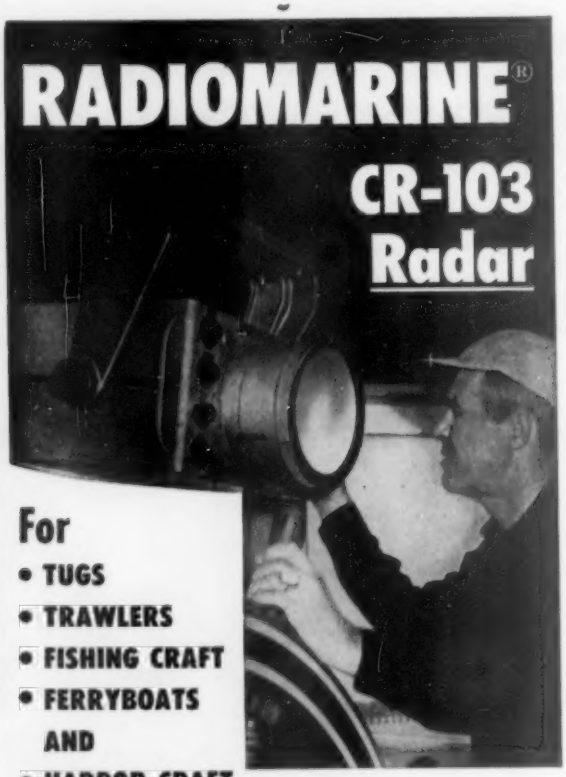

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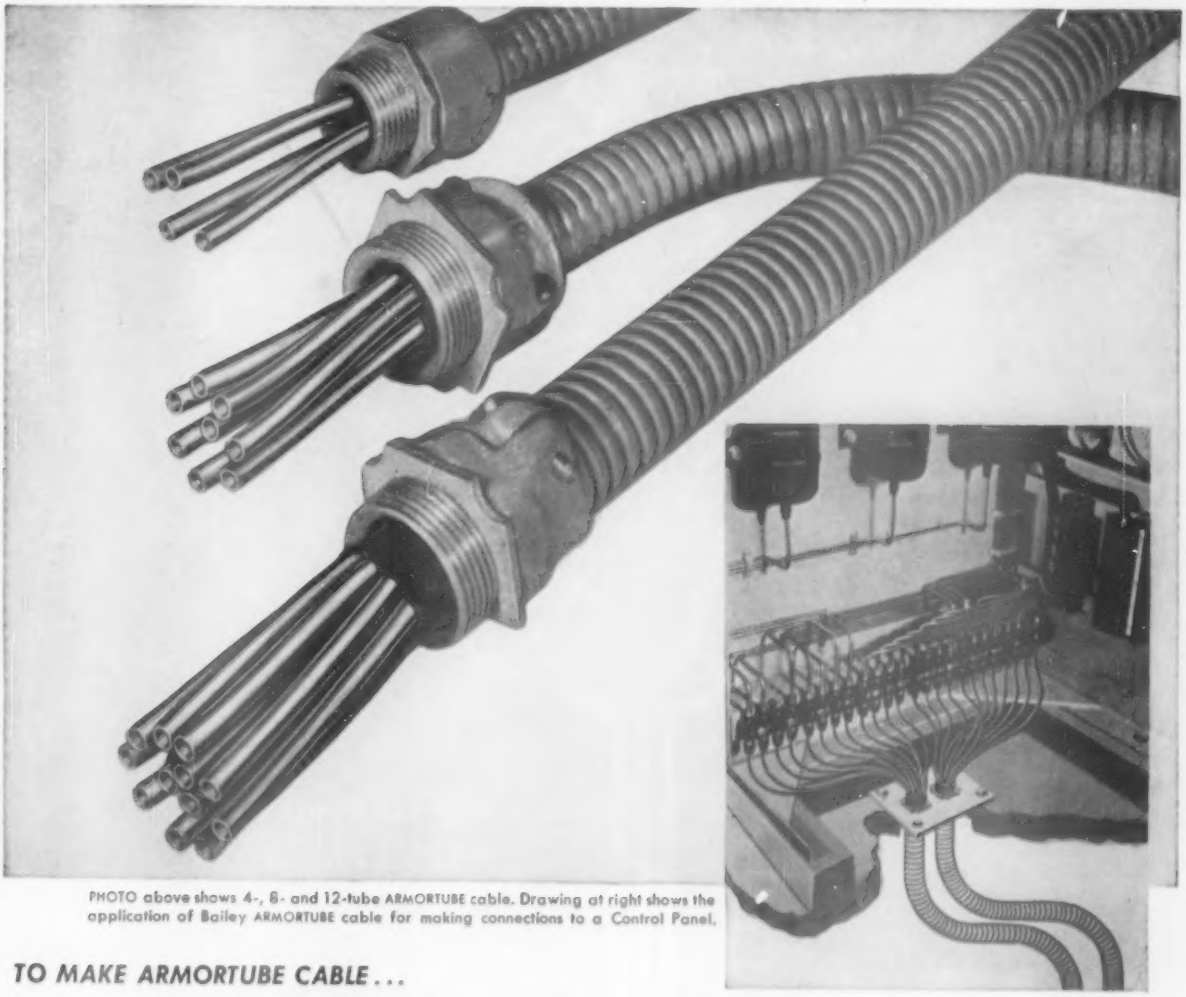

PHOTO above shows 4-, 6- and 12-tube ARMORTUBE cable. Drawing at right shows the application of Bailey ARMORTUBE cable for making connections to a Control Panel.

TO MAKE ARMORTUBE CABLE...

Bailey Meter Company turns to Anaconda for long lengths of ¼" O. D. copper tubes

Bailey Meter Co., Cleveland, Ohio, calls its ARMORTUBE Flexible Protected Tube Cable, "the modern shortcut to simpler, safer, more economical air and hydraulic circuits."

As shown above, this cable is available in bundles of four, eight or twelve ¼" O.D. copper tubes. A continuous, heavy galvanized steel strip protects the tube bundle.

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Because ARMORTUBE cable is shipped in random lengths of about 500 feet, Bailey needed long lengths of copper tube. Anaconda makes copper tube up to 2,400 feet long, depending on the diameter.

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These tubes had to be free from dust, dirt or metal chips which might otherwise interfere with the operation of delicate air and hydraulic circuits. Anaconda takes special care to see that inside surfaces of ANACONDA Copper Tubes are clean, smooth and bright. Tube ends are sealed to keep out moisture and foreign matter during storage.

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Tubes had to be flexible enough to bend around corners and obstacles. ANACONDA Copper Tubes are uniformly soft . . . highly flexible. And they are accurate in size and shape.

ANACONDA Dehydrated Copper Tubes are made in all standard sizes up to and including ⅞" O.D. Usually furnished in 25-, 50- and 100-foot coils, they are also available in longer lengths on spools and reels where required.

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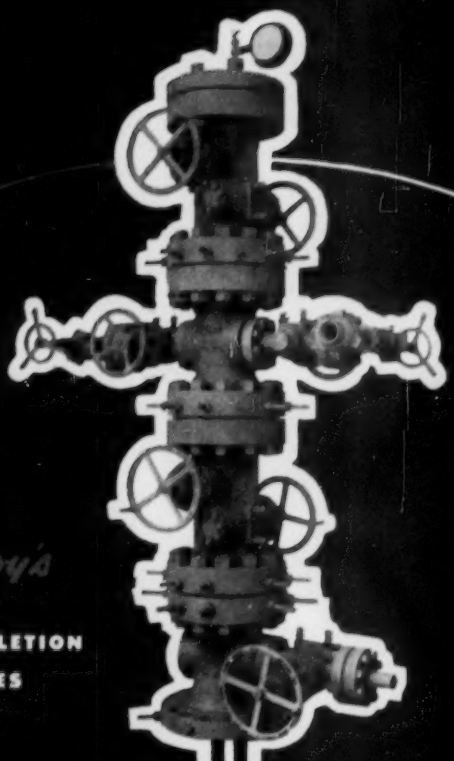

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F'rinstance, Hyatt's got a way of grinding the inside diameters of races that guarantees absolutely uniform wall thickness—developed it themselves. They use the finished race O.D. to produce perfectly concentric I.D. It's these "little" things you can't see with the naked eye that make a big difference in performance—and make me keep sayin':

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DISTRIBUTED BY DEALERS EVERYWHERE

A GENERAL MOTORS PRODUCT

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there's no substitute for . . .

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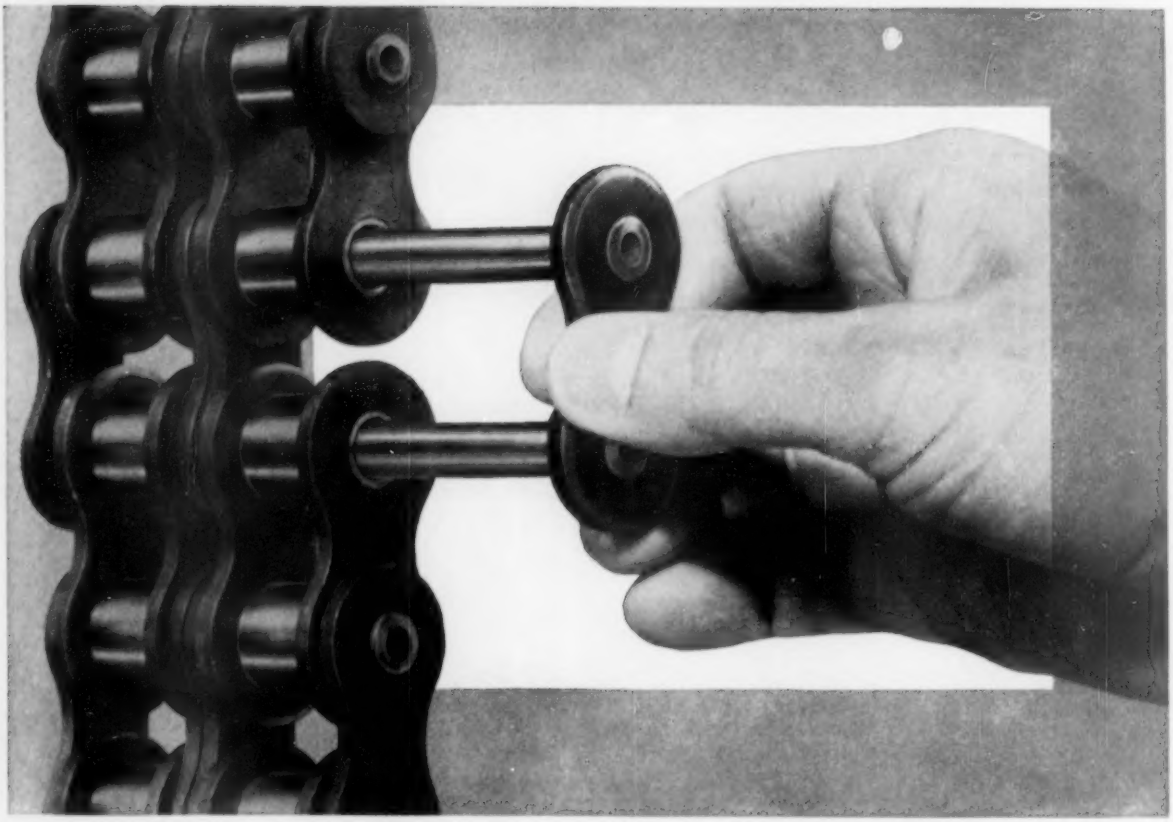

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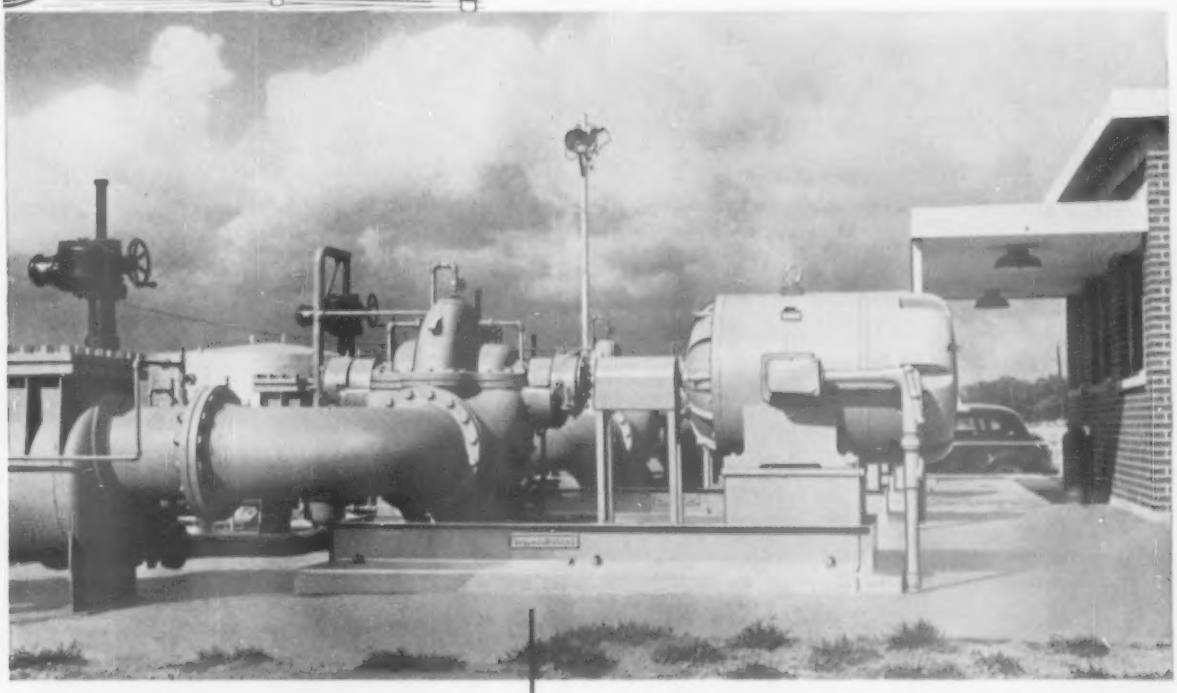
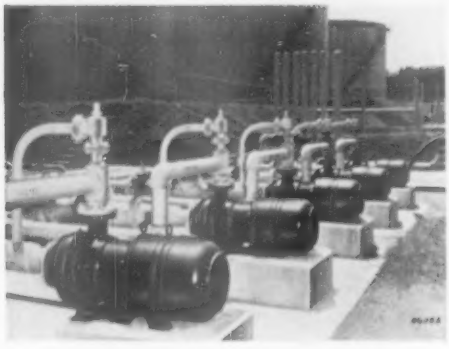
to reduce tanker "tie-up" time





I-R close-coupled Motorpumps, like those shown above, are also widely used in smaller bulk loading stations. But whatever the size, Ingersoll-Rand centrifugal pumps have the inherent *stamina* that means dependable performance year after year.

3 Ingersoll-Rand ALV pumps at Sun Oil's "Sun Station" have combined capacity of 16,800 gpm.

Loading time is an important factor in the efficient operation of Sun Oil Company's tanker fleet. Hence the trend to high capacity in pumping station facilities—as illustrated by the large Ingersoll-Rand loading pumps shown above at "Sun Station" in Beaumont, Texas. Each of these pumps is designed for 5600 gpm at 134' total head. Powered by 200 hp motors, they handle various grades of crude oil—for tanker loading and tank transfer service.

The entire operation of this tank station is designed for remote control from the modern, air-conditioned control room at the right in the photo above.

In tanker *unloading* too, I-R pumps have helped Sun Oil to set speed records. The S.S. Delaware Sun, for example, unloaded 213,000 bbl in 12 hours with three 4100 gpm Ingersoll-Rand HLV main cargo pumps.

Your I-R pump specialist will gladly discuss your requirements—and help you select the most efficient and economical pumping units for any type of installation.

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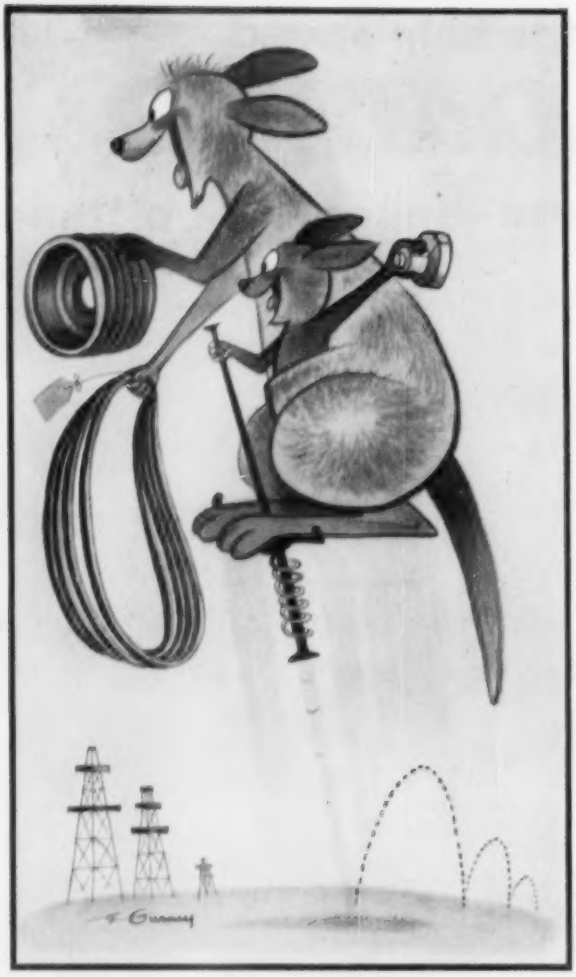

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Here's one case where speed of delivery is matched only by speed of installation. That's because a Worthington sheave — the original two-piece design — is "quick detachable" . . . easy to get on . . . and fits snugly on the shaft.

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★ For plain and prepacked liners and also combination cement jobs.

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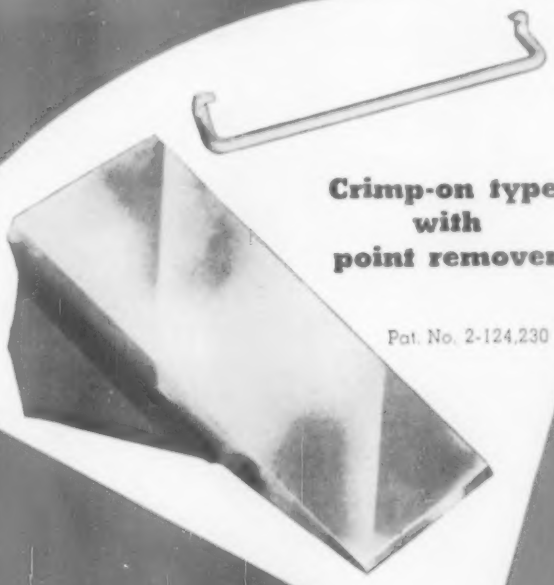

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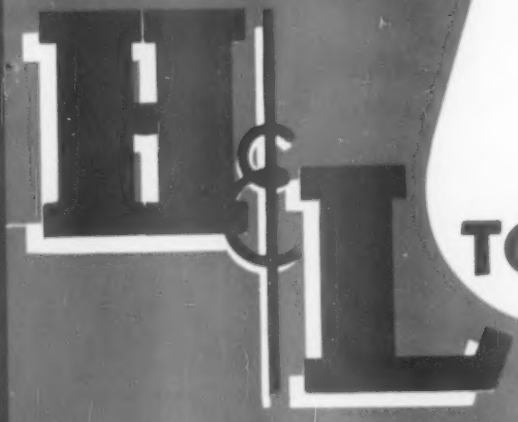

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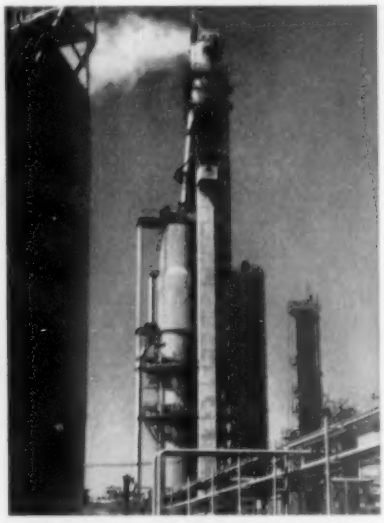
No matter how varied or complex the related facilities involved in the design and construction of your new plant, Kaiser Engineers has the breadth of experience and qualified personnel to assume sole responsibility for the design and construction of the complete project.



A Complete Processing Unit delivering high octane gasoline and fuel oils, this modern cat-cracker was installed for a southwestern refinery client by Kaiser Engineers from feed to finished product, from piling to aircraft beacon.

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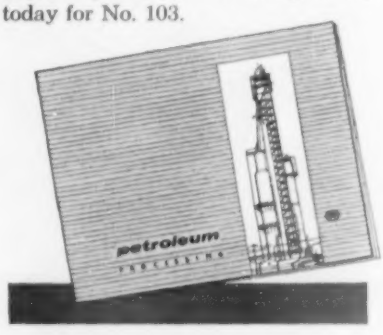

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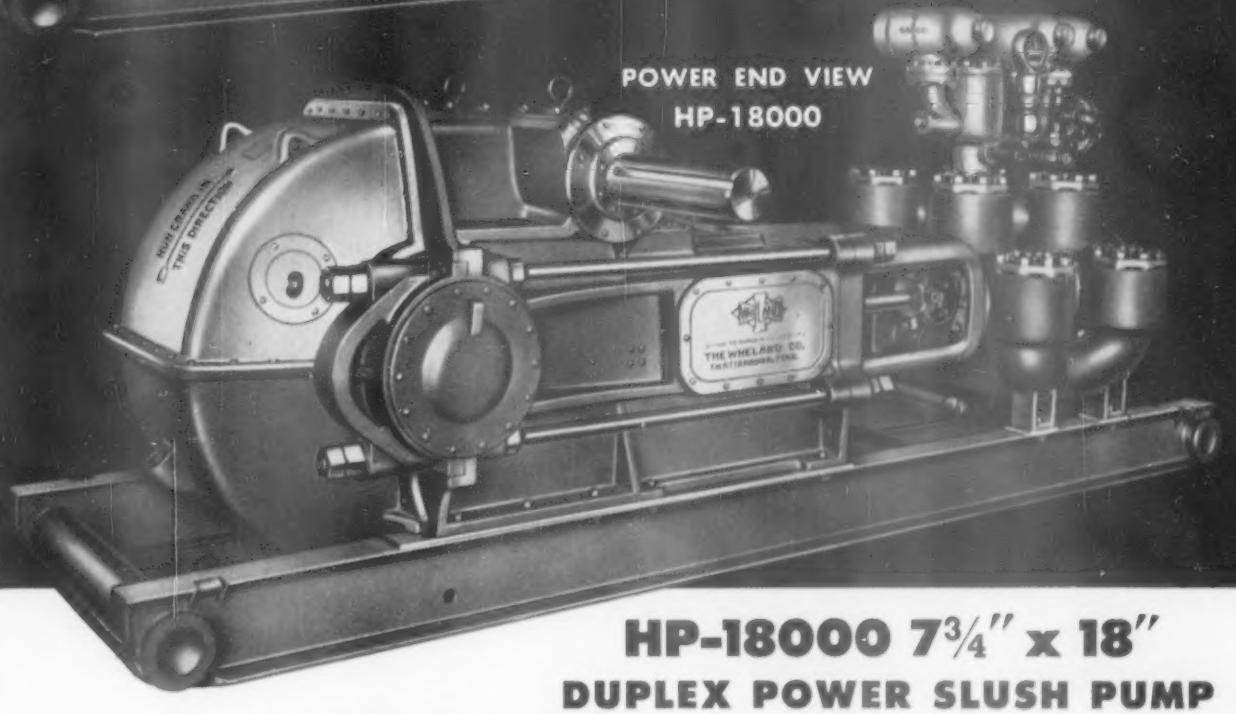
HP-18000



POWER END VIEW
HP-18000

HP-18000 7¾" x 18"
DUPLEX POWER SLUSH PUMP

750 HORSEPOWER at 60 RPM. Weight 36,377 lbs.

1322 lbs. mud pressure with 7¾" liner, 2,700 lbs. mud pressure with 5½" liner.

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For over 60 years, producing companies have looked to Jones for the best in sucker rods...for the many improvements in design and utility ...for service and satisfaction.

And, for over 60 years, they have learned to depend upon Jones. It's a good habit we have developed and one we intend to keep. If what you are using doesn't come up to your expectations, try Jones.

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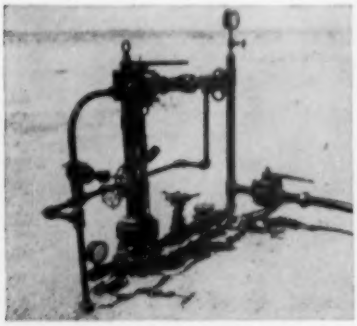
Kennametal* proved best by over 15 years of service in the oil industry

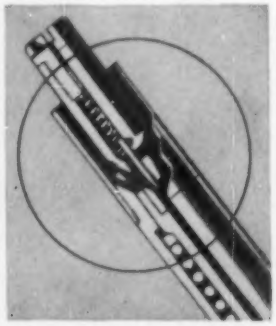
Provides many distinct advantages and benefits

Kennametal tungsten and titanium carbide compositions offer many production-increasing and cost-cutting advantages in lifting oil from great depths. First, is the long-life and wear-resistant qualities of Kennametal provided by its high resistance to corrosion, to spalling due to ball pounding, to sand abrasion, and to deformation under impact. Its high hardness prevents pitting and wire drawing.

Users' reports over the past 15 years indicate that Kennametal will last 20 times longer than steel and three to five times longer than special alloys. Ball and seat failures are cut, string pulling and pump repair costs reduced and well downtime and production losses held to a minimum.

It will pay you to try Kennametal balls and seats, balls and sleeves, cone valving, or other parts to combat wear, impact failure and corrosion. Kennametal costs you less in the long run. For further information, contact your regular supplier, or write to KENNAMETAL INC., Latrobe, Pennsylvania.





Kennametal ball and sleeve inserts are standard equipment in Kobe Free-Pump valves, selected by Kobe engineers after tests of various materials. In one operation, Kennametal in a Kobe valve plate operating at 50 to 80 closures per minute, has survived 9,000,000 closures under 3200 psi in oil and salt water fluid, produced from 8000 feet. Parts are acceptable for re-use and could easily give another 10 to 30,000,000 closures under these conditions.

Kennametal wear parts in this Otis bottom hole regulator provide 12,000,000 closures under 1200 psi in sand-sulfide fluid. Used parts illustrated have already given 3,628,000 closures in six months service, from 7000 feet.

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This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

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Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

- No internal wearing parts.
- No valves, pistons, or vanes.
- No internal lubrication.
- Low maintenance cost.
- Saves floor space.
- Desired delivery temperature automatically maintained.
- Slugs of liquid entering pump will do no harm.
- 75 pounds in a single stage.

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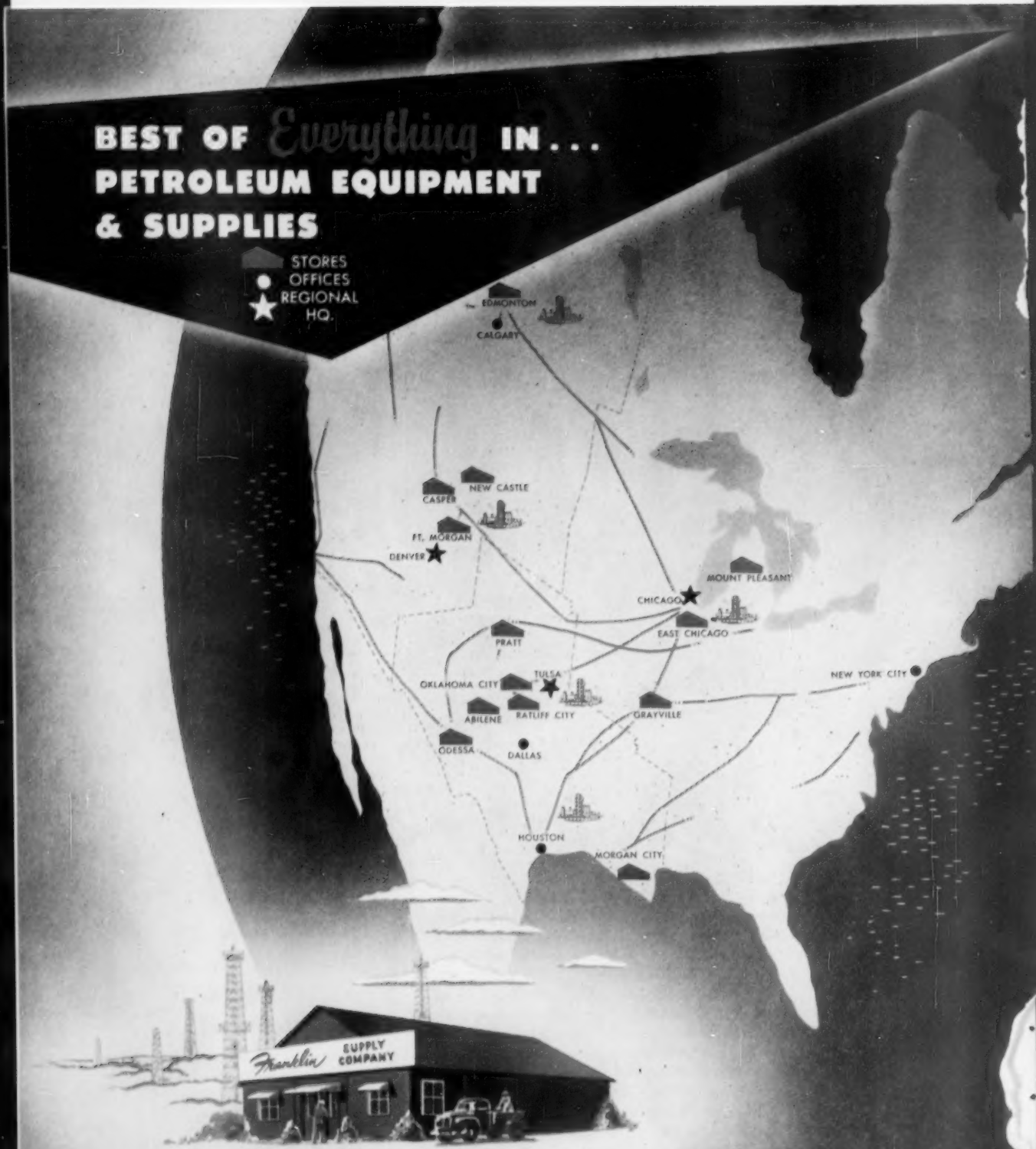

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Quality Product

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For Rotary Drilling, Setting Casing, or Handling Tubing, the WEB WILSON *HYDRA HOOK is winning unanimous approval.*

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THE OIL CUSHION provides controlled hydraulic spring action; eliminates "bouncing" the tool joint pin in the box; and avoids damage to the threads and sealing shoulders which results in dangerous, expensive "wash-outs."

THE OIL BATH ensures perfect, permanent lubrication, and increases the life of the Main Bearing, Springs and the Plunger by means of the famous Web Wilson "Dash-Pot" action.

NO "LOAD-CARRYING" THREADS in HYDRA HOOKS—another Web Wilson feature of *utmost importance* to you.

NO DANGER OF HANGING-UP in the derrick, because of the ultramodern streamlining and compactness of *HYDRA HOOKS*.

EASY TO "SPOT" PIPE—Spring travel from four inches in *HYDRA HOOKS* for tubing, to ten inches in the 450-Ton "giant" ensures fast alignment and safe thread engagement.

DUST-PROOF BODY—The sealed-off body of all *HYDRA HOOKS* prevents the entry of dust, rain or any foreign matter.

ALL SIZES FALL FAST AND FREE—Even the smallest *HYDRA HOOKS* have plenty of weight to fall fast.

FREE SWIVELLING—Whether loaded or unloaded, all *HYDRA HOOKS* are "free swivelling"—and they stay that way.

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LOCKED AGAINST ROTATION—Simple, protected mechanism locks in eight equally spaced positions; and operates with a simple, downward pull.

STRONG, "FUNCTIONAL" PARTS are efficient, simple, and fewer in number than ever before. Example: the Locking Mechanism to prevent rotation while drilling consists of *only three* parts.

"MAGNAFLUX" INSPECTION—*Each* part of *every HYDRA HOOK* is "Magnafluxed" and given other inspections before assembly. The complete hook is then checked on a test stand to ensure safe, effortless operation.

FEWER PARTS EASY TO OPERATE
EASY TO SERVICE

The minimum number of parts in the *HYDRA HOOK*—far less than in any hook ever before offered—are simple, strong, and functional in design. Operation is therefore safe, fast and easy for the crew; assembly and dis-assembly quickly performed. Example: an experienced crew can change both springs in a *HYDRA HOOK* in *two hours*, right *on the derrick floor*, and *no* special tools are required.

One of these seven sizes will exactly meet your needs . . .

HYDRA HOOKS **are available for tubing work as well as for the deepest drilling. Rated load-carrying capacities are 40-Ton, 65-Ton, 100-Ton, 150-Ton, 250-Ton, 350-Ton, 450-Ton.**

HYDRA HOOKS **can be "Direct-Connected" to any travelling block. Ask any Web Wilson office or representative for details.**

HYDRA HOOKS **are available "Unitized" with most travelling blocks to form a unit with minimum over-all length as pictured at right.**

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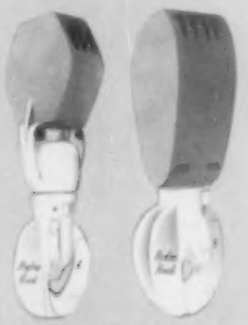

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We'll get it for you

(No postage required)

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You can do it CHEAPER with UTILITY Electric Power

Multiply These Installations by Thousands...

and you'll readily see why operators favor Utility Electric Power. Field after field of pumping wells are NOW COMPLETELY ELECTRIFIED. With wells powered AUTOMATICALLY by Utility Electric Power these operators have the added advantages of less manpower, less maintenance, and less over-all operating costs. Be sure of power when and where you need it... but be sure you make it Low Cost Utility Electric Power.

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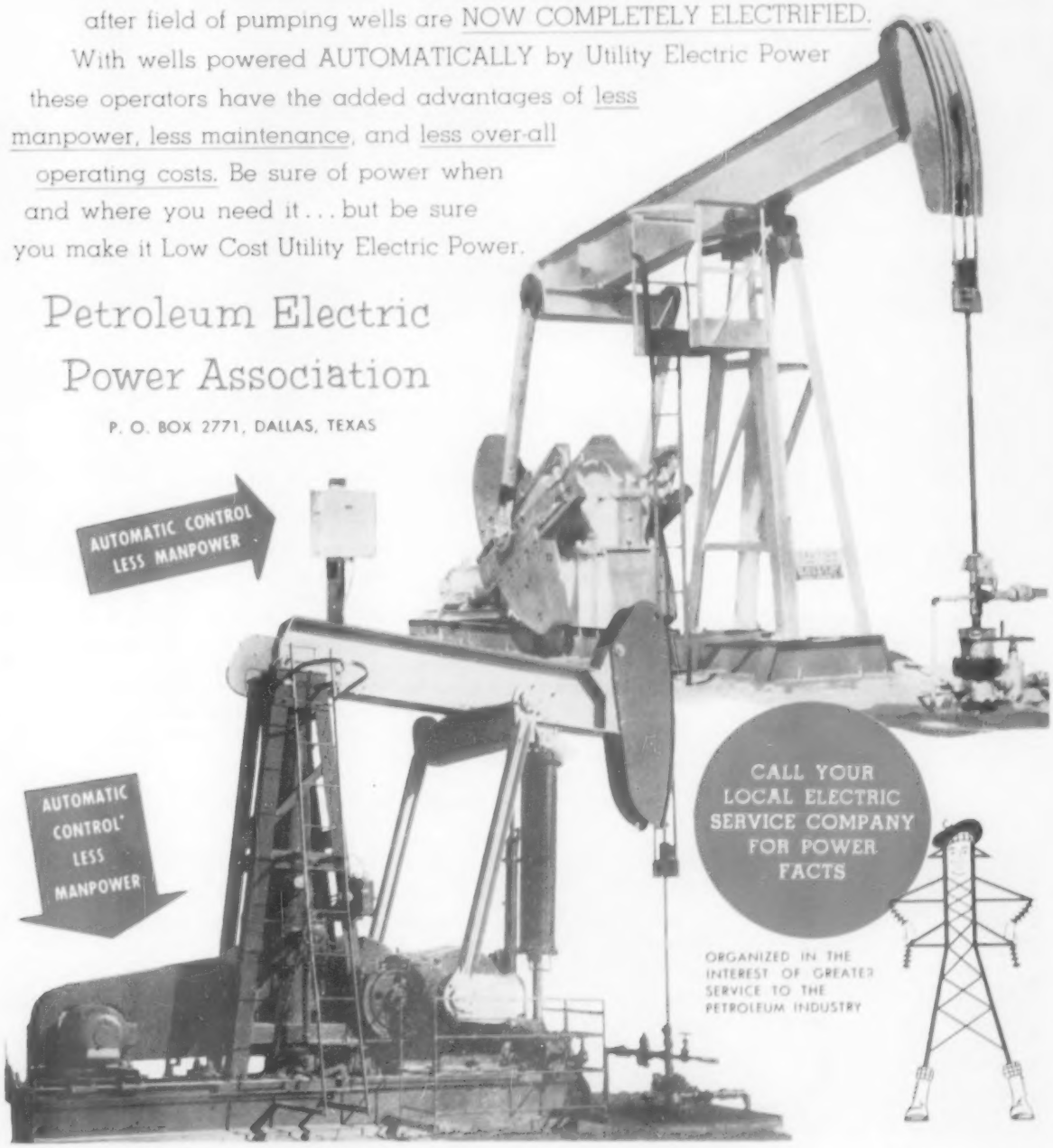

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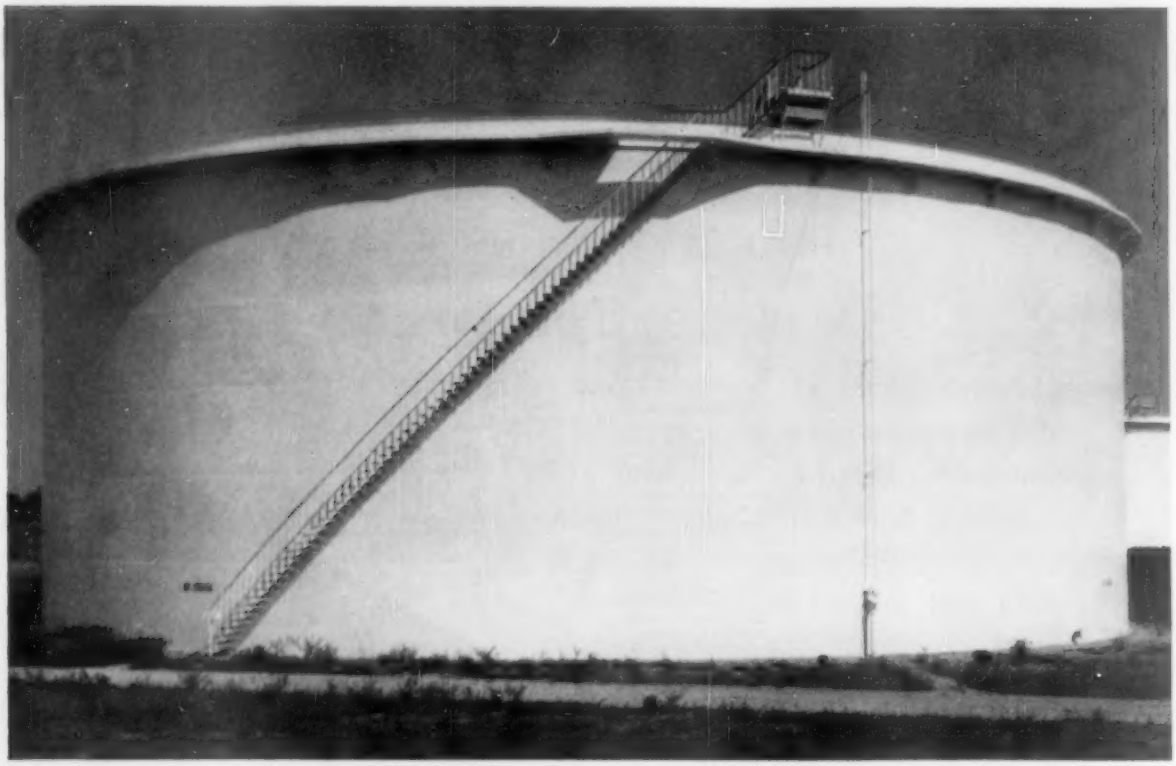


the GRAVER "Double-Deck"—our costliest... and often least expensive... floating roof design

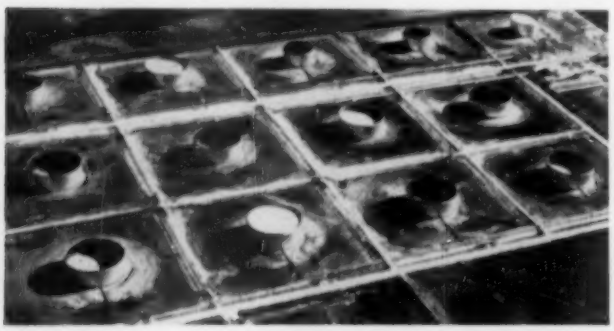
While the Graver Double-Deck Floating Roof Tank is the costliest of our three "floaters," it often proves least expensive in the long run.

Its unusual strength and structural stability make it appropriate wherever lots of snow and ice are encountered. The double-deck roof, consisting of top and bottom deck plate, is divided into liquid-tight compartments. Thus it is practically unsinkable. With the Graver Double-Deck Floating Roof Tank maintenance costs are held to a minimum.

Other popular Graver designs include the Center-Weighted Floating Roof Tank which is unusually stable. We offer also a pan-type floating roof...an economical design suitable to southern climates where snow and ice present no hazard.

Whatever your storage needs it will pay you to contact Graver. Consultation costs you nothing, and competent Conservation Engineers are ready to serve you.

GRAVER ...a conservative design to fit every need



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GRAVER TANK & MFG. CO., INC.

East Chicago, Indiana

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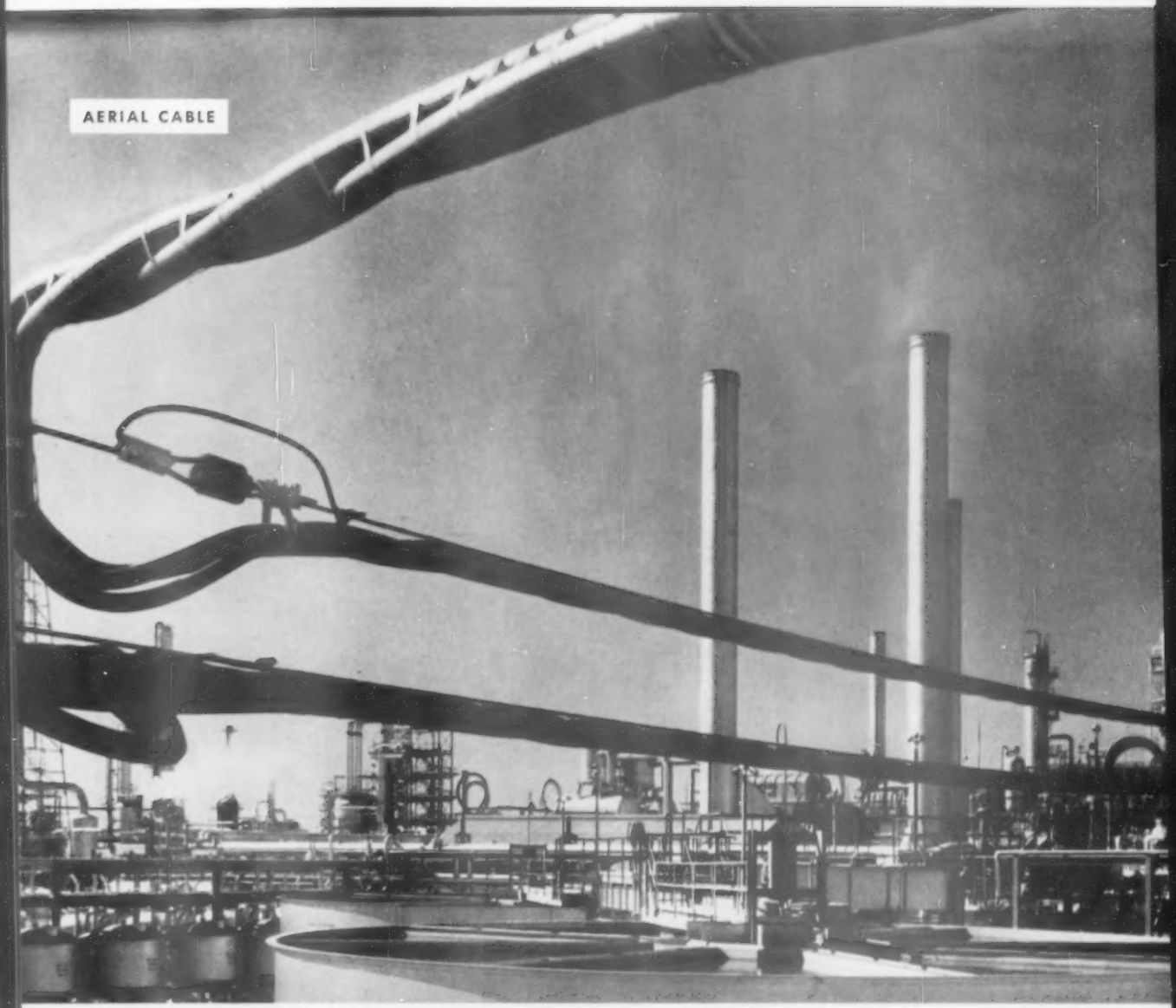


NEITHER STORM NOR HEAT NOR CORROSION knocks out ANACONDA's 3-conductor 15kv self-supporting Aerial Cable—shown here at Shell Oil's modern new refinery at Norco, La.

GO UP TO BRING COSTS DOWN

—with AnacondA Aerial Cable

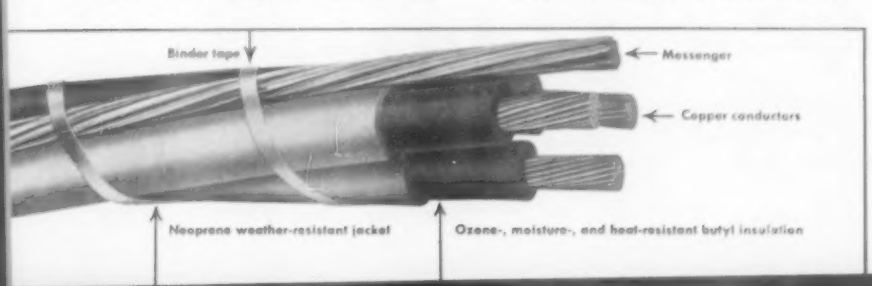
When new power is needed or when old circuits must be replaced quickly and at low cost—more and more plants are turning to ANACONDA Aerial Cable.

In plants where the maze of pipes and other underground structures often make installation of ducts or buried cable costly or difficult. This cable solves the problem.

It's fast, easy to install—particularly in crowded areas. No special ducts or crossarms or insulators are needed. Even in open areas, this rugged, neoprene-jacketed cable costs much less than buried systems.

You can see that it is neat. It is equally safe . . . and reliable!

Today's finest aerial cable! Type AB butyl insulation gives ANACONDA Aerial Cable the finest performance record. For the full story, call the Man from Anaconda today. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York. B2379



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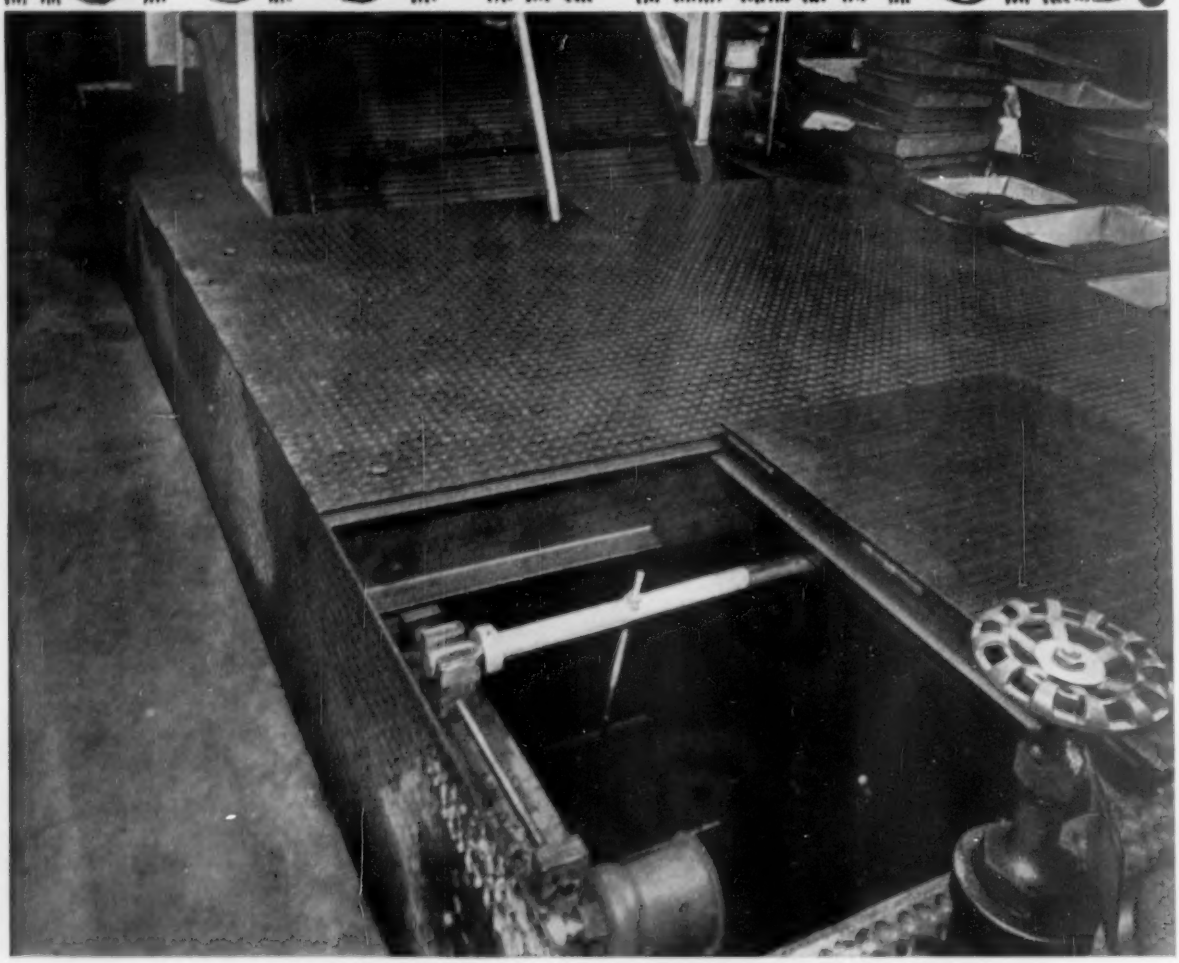
High-voltage Aerial Cable

HOT SPOT IN HARTFORD!



1575 GALLONS OF OIL NEAR A 1700° FURNACE!

A king-size oil quench is a bad enough fire hazard by itself. Put it next to a roaring, 1700 degree hardening furnace, and it could turn a plant into a cinder pile!

So the Allen Manufacturing Company discovered when they installed this hardening and tempering machine in their Hartford, Connecticut plant!

From the hardening furnace, hex-socket screws are quenched in oil, tempered, then quenched again. A flash fire in the huge oil quenching bath could mean loss of the machine, costly down time—and possible loss of the entire plant!

Safety-minded Allen executives naturally took proper precautions, held the oil far below its flash point with thermostatic temperature controls. Still, they realized that more protection was needed!

So Allen called on Kidde—long-time specialists in fire extinguishing systems.

Kidde engineers studied the problem, installed a special carbon dioxide extinguishing system which could be triggered instantly.

If fire strikes, one pull on a control handle pours clouds of fire-killing CO_2 over the blaze, snuffing flames in seconds. At the same time, pressure-operated switches in the lines leading to the discharge nozzles automatically shut down feeds and conveyor motors!

All fire hazards—dip tanks, flammable liquids and electrical equipment—are potential plant-wreckers. Make sure they get the *proven* protection of Kidde extinguishing equipment. Call your Kidde agent today!

Kidde

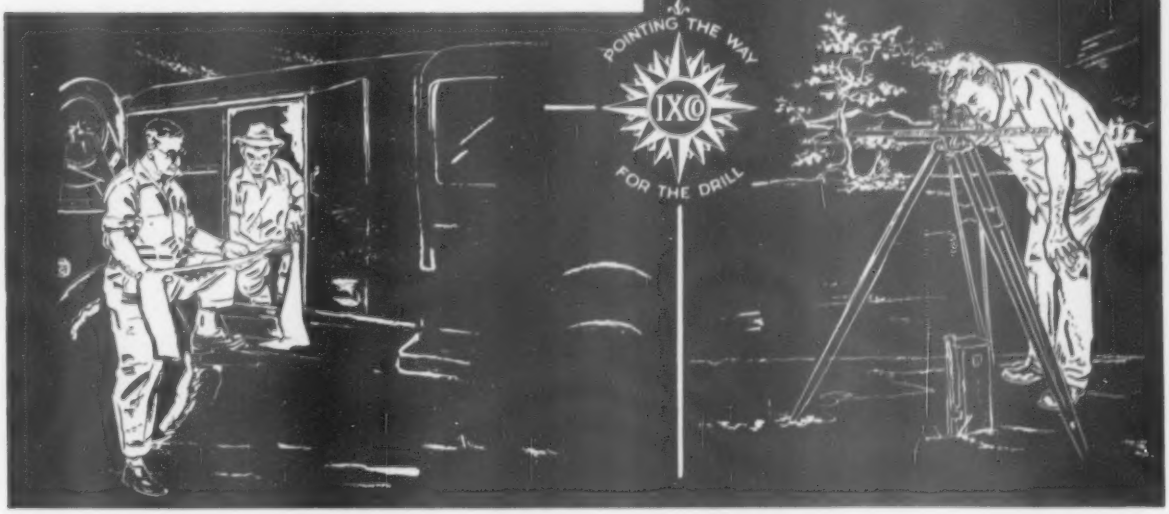
The words 'Kidde', 'Lux', 'Lux-O-Matic', 'Pyro-Frost' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc.
654 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

When he knows every job a crew performs, then a man is considered for the responsible position of an IX Party Chief. E. I. Grizzell worked his way up through a crew as a permit man, a surveyor, and a computor before he became a Party Chief. Grizzell's 18 years of field work with IX consistently results in better, more accurate survey work for our clients.

DERRICKS TODAY

Where I.X. Parties Were Yesterday



You can depend on the results of an IX survey! Your survey from Independent Exploration Company is made by parties that have been doing this identical work for years and years.

These parties are staffed with men who have made geophysical surveying their life work; who have watched new fields opened after their preliminary work. To IX personnel like these, your survey is important — will receive the extra care that will make your results clearer, more accurate, *and* a better value!

Independent

EXPLORATION COMPANY

Geophysical Surveys

1973 West Gray, Houston, Texas

39 Victoria St., London, SW 1, England

208 Dominion Bank Building, 8th Ave. & 1st St. East

Calgary, Alberta, Canada

COMPLETE
oil field
Production Equipment

Loss of time on installations, lack of engineering service and knowledge, multiple orders and shipments of various production equipment – all delay in bringing in profits on production. Why not integrate your production operations under one company, sound in production equipment knowledge, experience and know-how? You will find quicker profits and, most of all, you will find greater profits in the long run.

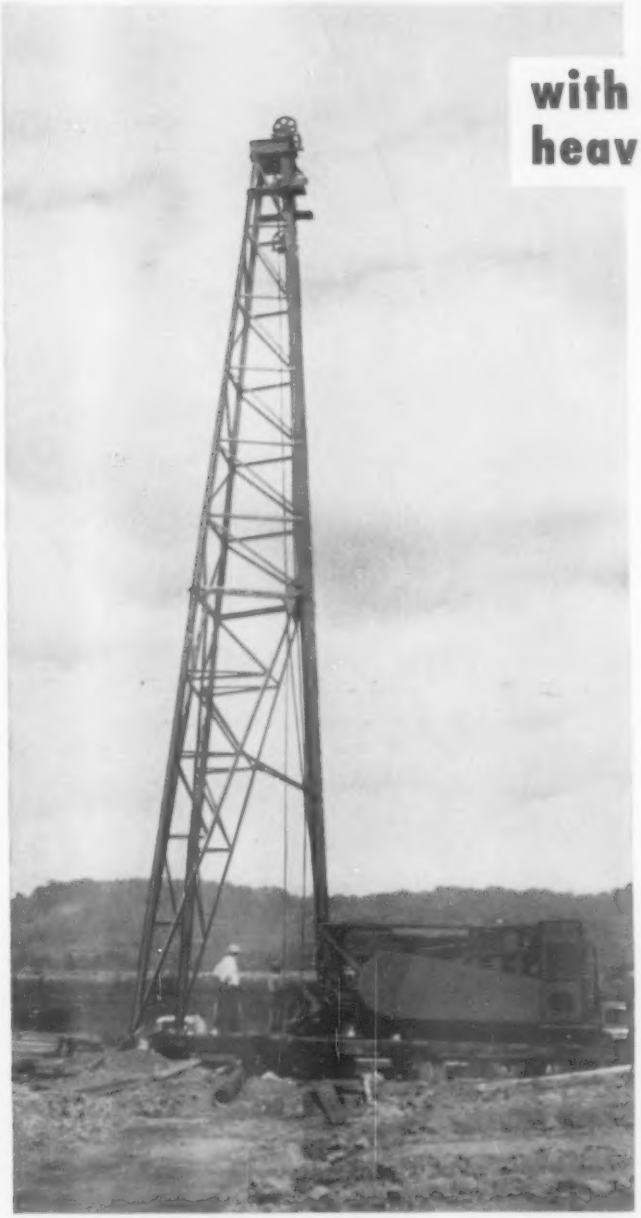
PRODUCTS
bolted steel tanks
welded steel tanks
stairway and walkway
vertical oil and gas separators
horizontal oil and gas separators
emulsion treater
indirect heaters

TYSCO

TYSON SMITH CO.

Eureka Underpass at Hempstead Hgwy. Phone UN 6111 Houston, Texas

boost casing-handling capacity, retain mobility



with 150-ton capacity heavy-duty tripod derrick

Already famous for top mobility in big capacity drills, Bucyrus-Erie 36-L and 48-L spudders can now be equipped for even greater casing-handling capacity with the addition of a heavy-duty tripod derrick. This is the *first* 150-ton derrick of this type designed especially for a spudder. Completely raised, the derrick is 70′ 4″ high; static load capacity is 300,000 pounds, when rigged for 10-part hoist.

Despite the size of this special derrick, you lose nothing in the way of mobility because it is surprisingly easy to set-up, tear down, and move. Here's why:

1. SIMPLE DESIGN. Derrick assembly consists of but five sections which include a special substructure, plus a gin pole used in erection.
2. EASE OF FIELD ERECTION. Sections are assembled on the ground, derrick legs hinged to base. With gin pole in place, derrick is raised to vertical position, using bull reel drum for hoisting. When the derrick is completely raised, the main front lower section swings into place. The gin pole is removed and you're ready to string tools. Lowering and dismantling is equally simple.
3. FAST JOB-TO-JOB MOVES. Moving the derrick, because of its design simplicity, is fast and easy. The entire structure can be disassembled into five separate units for moving.

The heavy-duty tripod derrick is available for 36-L's and 48-L's already in the field, or may be ordered with a new machine in place of the regular derrick. For all the details, see your local Bucyrus-Erie distributor.

19555

BUCYRUS-ERIE COMPANY
SOUTH MILWAUKEE, WISCONSIN

BUCYRUS ERIE

36-L	Top-to-bottom drilling to 3,500 feet Servicing to 4,000 feet Swings up to 4,200 pounds of tools
48-L	Top-to-bottom drilling to 6,000 feet Servicing to 7,000 feet Swings up to 6,000 pounds of tools

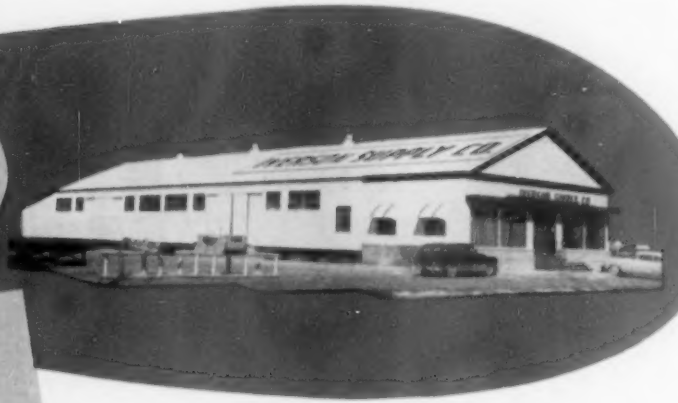
IVERSON

FAST SUPPLY STORE SERVICE

IVERSON SUPPLY COMPANY'S stores pride themselves on filling the needs of their customers completely and with greatest speed. Back of the products is the integrity of the manufacturer and a guarantee of satisfaction. With this is the long years of experience of IVERSON representatives under practically all oil industry conditions. Their advice, based on knowledge and sound judgment, is part of our company's service.

● WHATEVER YOUR REQUIREMENTS CHECK WITH IVERSON FIRST

Stores at Artesia and Farmington, New Mexico; Ada, Oklahoma City, Okmulgee and Tulsa, Oklahoma; Kermit, Odessa, and Snyder, Texas; and Price, Utah.



IVERSON'S NEW STORE AT ODESSA, TEXAS

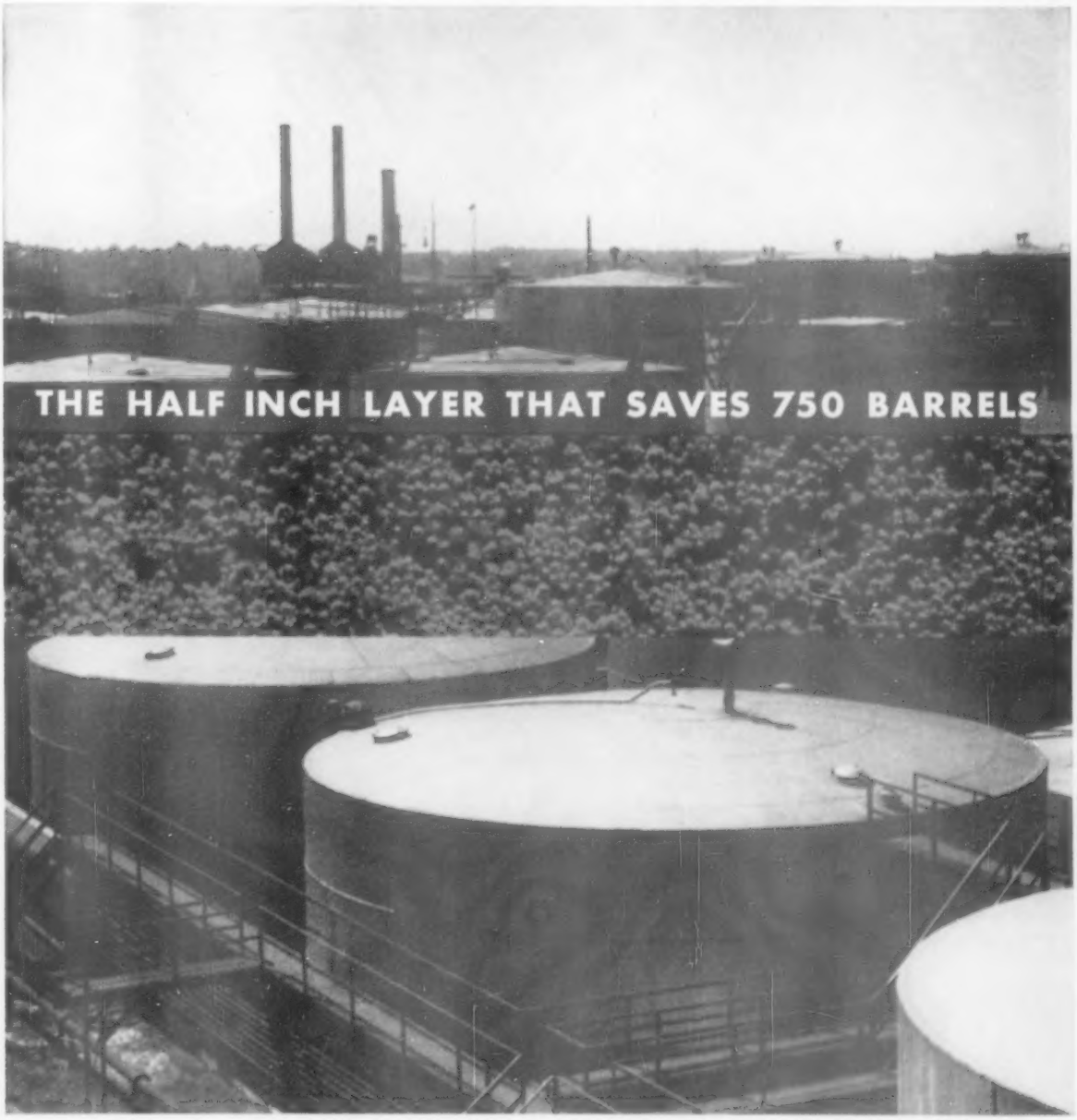
OFFICES: FT. WORTH, DALLAS & MIDLAND, TEXAS

IVERSON SUPPLY COMPANY

DRILLING-PRODUCTION AND REFINERY EQUIPMENT

P.O. BOX 1439 TULSA 1, OKLA.

OFFICES: DENVER, COLORADO TULSA, OKLAHOMA



The color band, enlarged about 60 times, shows the composition of a half-inch layer of Microballoon* spheres in a crude oil storage tank. These microscopic spheres of BAKELITE Phenolic Resin can cut evaporation of costly volatiles as much as 80%. In an 88-foot diameter tank, that's over 750 barrels saved in a year! The first year's savings can write off the initial installation costs.

In bulk, these spheres resemble finely-ground, reddish-brown flour. Installation is fast, inexpensive. The powder is pumped into the tank with the oil. The hollow spheres float to the surface in a matter of minutes, forming a blanket. Non-abrading, they won't harm pumping equipment or pipe lines. The blanket fits closely around internal supports and tank sides, rises and lowers with the oil level, keeping the surface completely covered.

Put the lid on evaporation loss now with these spheres of BAKELITE Phenolic Resin. Learn more about them by writing Dept. AM-128.

*Trade-mark of The Standard Oil Company (Ohio)

BAKELITE BRAND Phenolic Resins

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N.Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

24 ACRES *Cover the World*

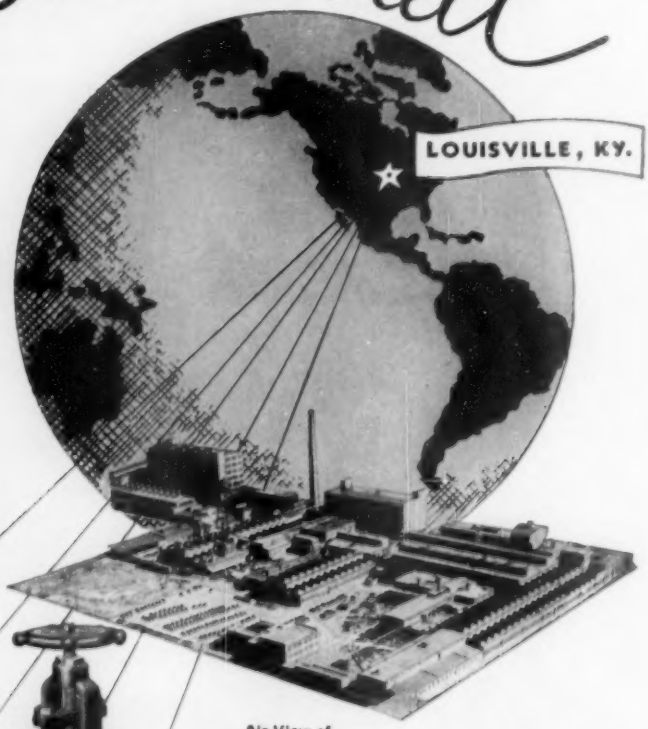
. . . with TOP QUALITY

DROP FORGED STEEL

VALVES, FITTINGS and FLANGES

by

Vogt



Air View of
Henry Vogt Machine Co.

This 24 acre Vogt plant supplies the most comprehensive line of top quality *drop forged* steel piping materials anywhere available to industry. That's why they're the choice of leading refineries, power plants, chemical plants, etc., the world around!

OUR COMPLETE LINE INCLUDES

Flanged, Screwed and Socket Weld End Globe, Gate and Check Valves • Ells, Tees and Crosses • Couplings • Bushings • Plugs • Unions • Flanges and Flange Unions • Welding Heads

HENRY VOGT MACHINE CO. LOUISVILLE 10, KY.

Branch Offices: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.

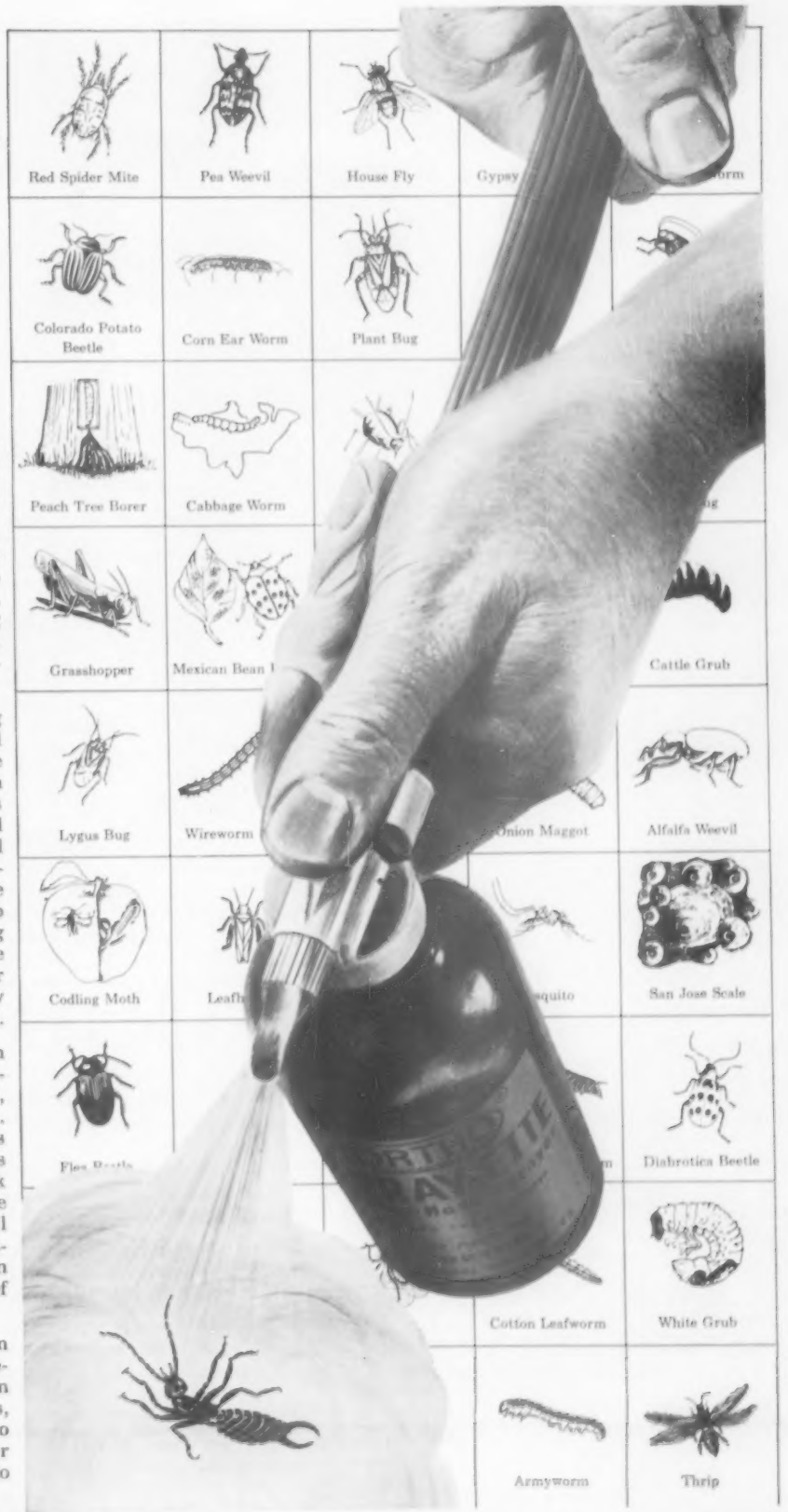
There's not enough food for you and the bugs

As any backyard gardener knows, you have a fight on your hands from the moment you turn over your first spadeful of earth. At every step, fungus growths, weeds, and insects that chew, insects that suck are waiting to destroy your lawns, trees, plants, flowers. It is a disheartening struggle for Greenthumbers . . . a round-the-clock fight for commercial farmers.

Fortunately, there's a growing list of weapons we now can wield in the battle against bugs. Some of the most effective have been developed in the laboratories of California Spray-Chemical Corporation, a Standard Oil Company of California subsidiary. In 1907, we brought out the first basic lead arsenate to stop the codling moth, a rampaging fruit crop destroyer; later, the invention of new-type summer and dormant oil sprays safely checked scale and other insects.

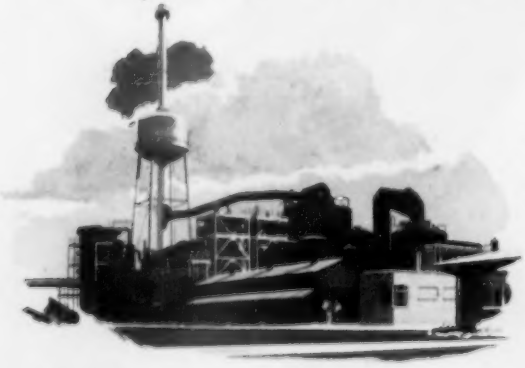
Other Standard research achievements have been chemicals to kill aphis, mites, thrips, and similar sucking insects . . . dusts to destroy fungus diseases like rust, blight, mildew...sprays and dusts custom-made to knock out such public enemies as the devastating grasshopper, boll weevil, hornworm. Other pest-killers boost milk production from our dairy herds, help beef cattle fatten faster.

One good reason you live in the world's best-fed nation is because insect invaders have been held back on our farms, ranches, and orchards, thanks in part to Standard's constant hunt for new ways to make petroleum do more things for you.



STANDARD OIL COMPANY OF CALIFORNIA *plans ahead to serve you better*

Hold on there!... there's a better way!



YOU CAN NOW DISPOSE OF YOUR SLUDGE SULPHURIC ACID BY SHIPPING IT BACK TO CONSOLIDATED FOR REGENERATION

Two unique sludge acid regeneration units at Houston and Baytown, Texas, were recently put on stream by Consolidated's Southern Division.

The new facilities will convert into new white sulphuric acid any grade of sludge—providing only that it can be pumped from the tank car or barge.

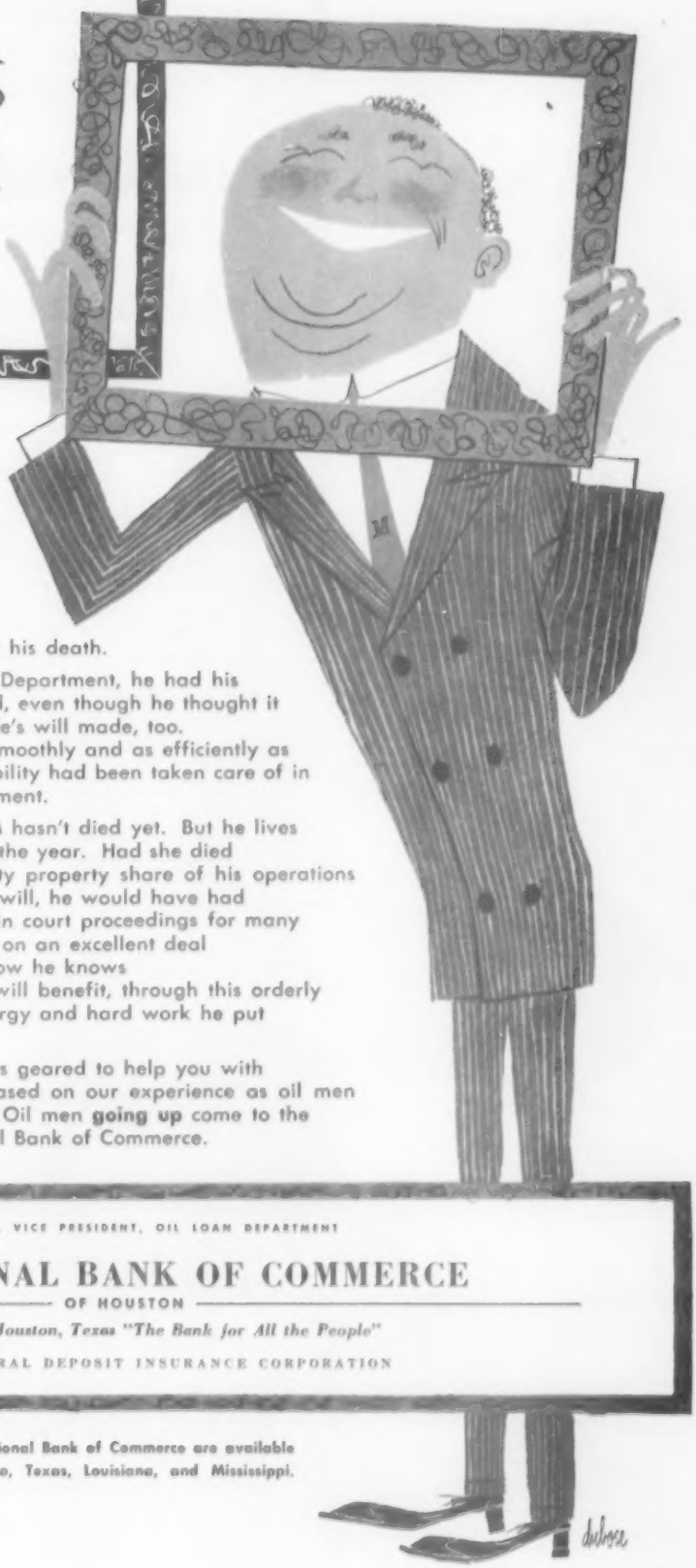
This new Consolidated service relieves petrochemical plant managers of the expense and bother of disposing of sludge by other means. Furthermore, it completely eliminates the danger of air and stream pollution.

Talk to the Consolidated man about your sludge acid problems. He can help you.

CONSOLIDATED CHEMICAL INDUSTRIES INC.

640 ESPERSON BUILDING • HOUSTON 2, TEXAS 380 MADISON AVE. • NEW YORK 17, NEW YORK

Mr. "M" was the picture of health



Mr. M. was in the best of health, and when we first suggested that he take certain steps in case of death he thought it was a lot of needless trouble. We showed him how our Trust Department could arrange his affairs in an orderly way, and allow his operation to continue after his death.

Following the advice of our Trust Department, he had his lawyer draw up a will for him. And, even though he thought it was a waste of time, he had his wife's will made, too. His finances were set up to run as smoothly and as efficiently as his oil operation. Every future possibility had been taken care of in the plans made by the Trust Department.

Now this story has a twist. Mr. M hasn't died yet. But he lives in Texas, and his wife died early in the year. Had she died without a will, and if her community property share of his operations had not been taken care of by such will, he would have had a sizable part of his estate tied up in court proceedings for many months. He would have missed out on an excellent deal which he was able to make. And now he knows that when he does die his children will benefit, through this orderly financial arrangement, from the energy and hard work he put into building his holdings.

The National Bank of Commerce is geared to help you with your problems. Impartial advice, based on our experience as oil men and money men will help you, too. Oil men **going up** come to the Oil Loan Department of The National Bank of Commerce.

E. O. BUCK, VICE PRESIDENT, OIL LOAN DEPARTMENT

THE NATIONAL BANK OF COMMERCE

OF HOUSTON

Gulf Building, Houston, Texas "The Bank for All the People"

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

Facilities of the Oil Loan Department of The National Bank of Commerce are available in Wyoming, Colorado, Nebraska, New Mexico, Texas, Louisiana, and Mississippi.

WHY ...have LELAND

explosion-proof gasoline pump motors

outsold all others combined

— again in 1954 as for over thirty years?

Because year after year Leland motors have continued to provide such *extremely reliable, trouble-free* service that users have come to expect, and *look for*, the extra performance a Leland delivers.

This Leland performance and popularity is the result of design and engineering representing the finest efforts of experts—materials and workmanship that are strictly top-level—testing and inspection that is thorough and uncompromising.

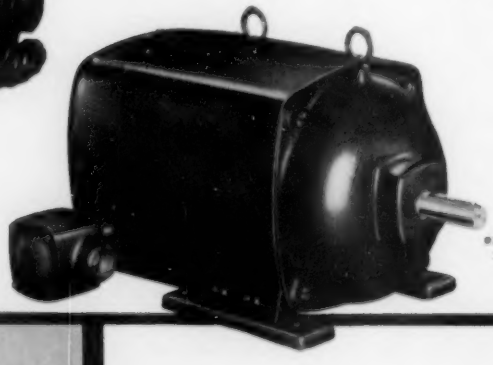
For over thirty years, Leland has operated on the principle that motors should not merely *meet* specifications, but *surpass* them.

It isn't that we expect all motors to suffer abuse or extra hard service. It's just that a Leland motor is built to *take* unusual demands, if and when they arise.

For over thirty years, Leland has been supplying this extra quality and durability in open drip-proof, totally enclosed, and in Underwriters' Approved explosion-proof motors. Today, the Leland motor line is unusually complete from ⅛ through 5 horsepower. Many standards are carried in stock. And specials, like the dispensing pump motor, are in use by many leading equipment manufacturers.

Have you tried a Leland motor on *your* product? Why not write and let us give you the benefit of this superior design ability.

Leland Type RA, repulsion start, induction run, ¾ HP continuous duty explosion-proof gasoline pump motor, (Underwriters' Approved, Class I, Group D)



Leland Type PA, polyphase, explosion-proof (Underwriters Approved Class I, Group D), externally fan cooled, ball bearing, integral HP

Another AMF Product

LELAND MOTORS

THE LELAND ELECTRIC COMPANY
Division of American Machine & Foundry Company
Dayton 1, Ohio

HOW TO—

stop mud valve troubles on drilling rigs

Switch to
Competitively-priced,
Rockwell-Built **MUDWONDER**
Valves for ALL Mudline Services

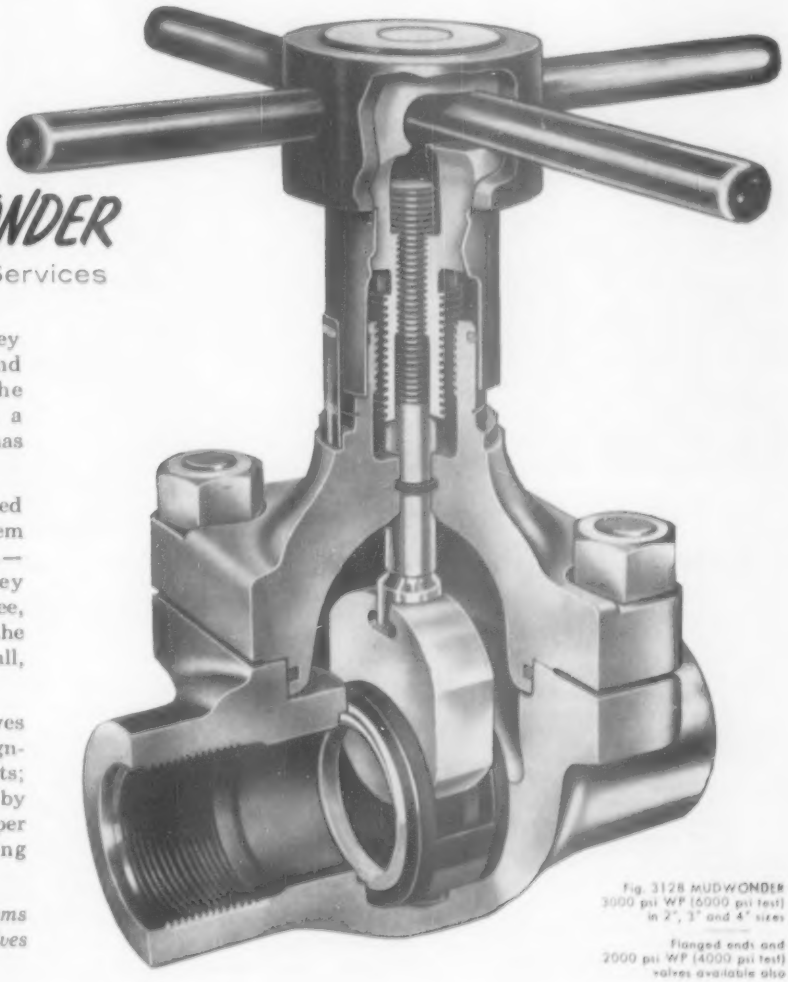


Fig. 3128 MUDWONDER 3000 psi WP (6000 psi test) in 2", 3" and 4" sizes

Flanged ends and 2000 psi WP (4000 psi test) valves available also

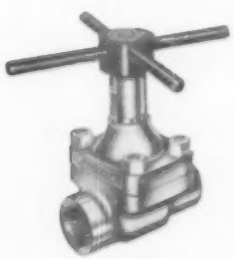
You no longer have to waste money and time rigging, maintaining and repairing old mud valves. Now, the Rockwell-Built MUDWONDER with a minimum number of wearing parts has completely proved itself.

Drilling men who have purchased MUDWONDER valves and have used them on their rigs—yes, even abused them—are switching to MUDWONDER. They know the MUDWONDER as a trouble-free, long wearing valve. They found the MUDWONDER more economical to install, to operate, to maintain.

What makes MUDWONDER valves so good? Three things—proper designing by valve engineering specialists; proper selection of part materials by valve metallurgical specialists; proper manufacturing by valve building specialists.

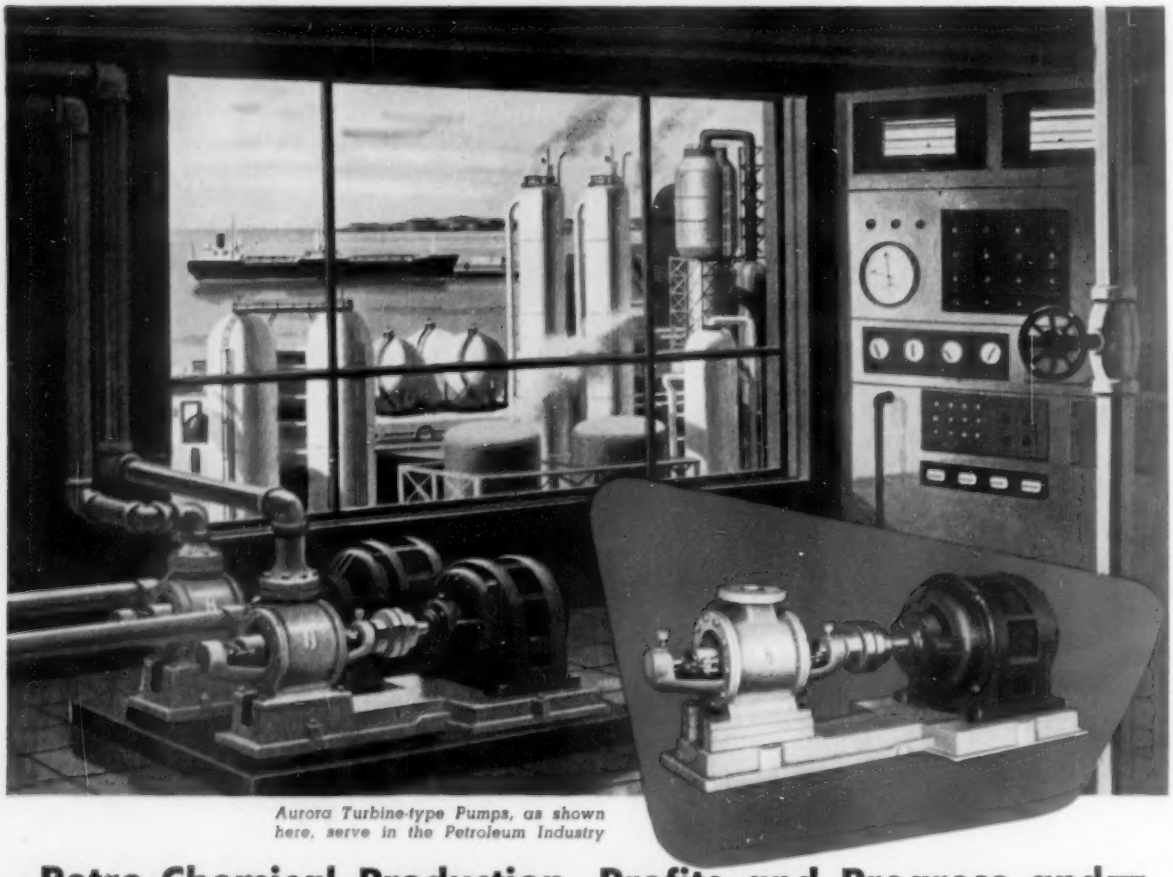
Stop mudline flow control problems today. Replace troublesome mud valves with MUDWONDER *now.*

You can expect the Rockwell-Built MUDWONDER to: SLASH DOWNTIME ... CUT MAINTENANCE ... GIVE LONGER SERVICE ... OPERATE EASIER, FASTER ... KEEP MUDLINES INTACT ... STOP SANDING-UP



Ask your favorite oil field supplier for more information or write to Edward for Catalog 12-S.

Edward Valves, Inc.
Subsidiary of ROCKWELL MANUFACTURING COMPANY
1212 W. 145th Street, East Chicago, Indiana



Aurora Turbine-type Pumps, as shown here, serve in the Petroleum Industry

Petro-Chemical Production, Profits and Progress and—

FLUID POWER

Many industries lean heavily upon pumps for various stages of production. But in none is there a more definite tie-up between the profit and loss statement and Fluid Power than in Petro-Chem and Petroleum Refining. The movement of liquids (to perform the essential operations for converting them from raw material to finished product), entails a wide variety of conditions and requirements. There are, for example: high pressure/small volume . . . low pressure/large volume . . . accurate, metered flow . . . icy cold, boiling hot . . . acid, alkaline or neutral . . . clear clean, colloidal or semi-solid. And, for any of these conditions there's a pump bearing The New York Air Brake Company mark ideally suited to do the job. For liquid handling services: AURORA Turbine and Centrifugal Pumps and KINNEY Heliquad Gear and Rotating Plunger Pumps.

DUDCO, HYDRECO and STRATOPOWER high pressure Hydraulic Pumps provide Fluid Power for rotary or linear motion in process automation or for added safety where toxic, flammable or explosive materials are present. There are: HYDRECO Gear Type Pumps and Motors, Valves and Cylinders for 1000/1500 psi operation . . . DUDCO Dual-Vane Pumps and Motors for 2000 psi circuits and . . . DUDCO and STRATOPOWER Piston Pumps delivering pressures to 5000 psi.

Finally there is Fluid Power in reverse . . . KINNEY High Vacuum Pumps to step up distillation, dehydration, deaeration and other production and profit functions.

DUDCO DIVISION
Hazel Park, Mich.
Dual-Vane Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 7 to 140 hp; 2000 psi operation. Piston-Type Pumps for 5000 psi.

HYDRECO DIVISION
Cleveland, Ohio
Gear-Type Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 3 to 52 hp; Cylinders; Control and Auxiliary Valves; 1500 psi.

WATERTOWN DIVISION
Watertown, N. Y.
Railroad air brake valves for freight and passenger equipment, STRATOPOWER Hydraulic Pumps for Aircraft, to 3000 psi.

KINNEY MANUFACTURING DIVISION
Boston, Mass.
Rotating Plunger and Heliquad Liquid Handling Pumps, to 3000 gpm. Vacuum Pumps, 0.2 micron, evacuate 1800 cfm.

AURORA PUMP DIVISION
Aurora, Ill.
Liquid Handling Pumps, Centrifugals and deep well Turbines, 7000 gpm, 500 ft. heads. Turbine-type, 150 gpm, 600 ft. heads. Condensate Return Units.

Complete your file of data on new developments in the New York Air Brake family of advanced performance equipment. Write for catalogs today!

THE NEW YORK AIR BRAKE COMPANY

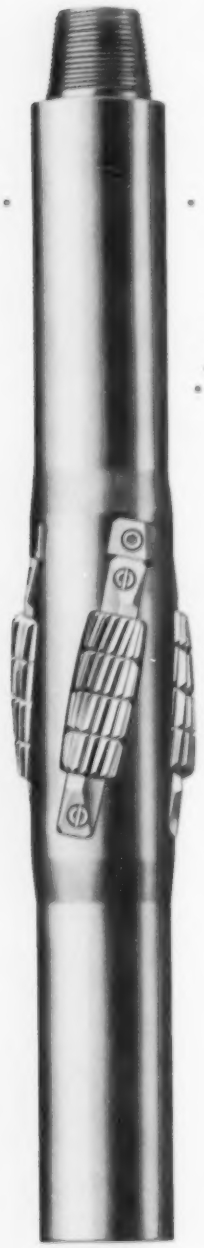
230 PARK AVENUE • NEW YORK 17, N. Y.

INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

GRANT
OIL TOOL COMPANY

Grant specializes in just one job: Engineering the Tools that help you drill wells better.

This angle on reamers makes good sense – and better hole ...only Grant has it!



Model 1530
Regular Reamer

By angling the cutters on Grant Reamers *to the right*, you get three important advantages that make Grant the logical, sensible choice for reaming or stabilizing in all formations...

1. Grant's "angled right" cutters provide the shearing and cutting action that slices away the formation. A Grant always *cuts* its way through, producing a round, full-gauge hole.

2. By angling cutters *right*, Grant Reamers have a tendency to rise. You can't cork-screw the reamer into tight hole–an exclusive Grant feature!

3. With cutters angled to the *right*, a Grant Reamer requires application of the downward weight necessary for positive reaming action.

But *right* angled cutters are not all! There are *no welds* of any kind on this forged steel body, insuring maximum strength and ruggedness. All cutter parts subject to wear are components of one discardable assembly. A wrench is all you need to dress your Grant for another run. More sense-making, money-saving Grant features!

Cross section of Grant Reamer Cutter Assembly. Cutter pins and bushings are dove-tailed into the Reamer body so that they cannot come out under any conditions!

1 Blade Wall Scraper | Underreamer | Cushion Stabilizer | Casing Scraper | Model 6480 A Reamer Near Bit Type

Whether you're reaming or stabilizing – or both – there is a Grant 3, 6 or 9-point Reamer and the proper cutter type for the job. To get the complete story, simply write for Bulletin 62, or ask the Grant field man in your territory for the full details.

Get the facts before you – today!

GRANT
OIL TOOL COMPANY

Main Office and Plant: 2042 East Vernon Avenue, Los Angeles 58, California

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Avenal – Phone 228
Bakersfield – Phone FAirview 5-0507
Compton – Phone NEwmark 5-8041
TEXAS – Ocessa – Phone 6-4892
LOUISIANA – Lafayette – Phone 8-7648
NEW MEXICO – Hobbs – Phone 3-6211
CANADA – Edmonton – Phone 33-2233
EXPORT – New York City – Phone Hanover 2-2455

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SUPPLY BOVAIRD COMPANY

TO GET WHAT YOU WANT
WHERE YOU WANT IT
WHEN YOU NEED IT...
AT REASONABLE
COMPETITIVE PRICES

"Buy From Bovaird"

PRODUCTION
REFINING
DRILLING
PIPELINE

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NEW MEXICO — Lovington
OKLAHOMA — Duncan, Oklahoma City, Pauls Valley, Sapulpa, Seminole, Tulsa
TEXAS — Abilene, Borger, Dallas, Houston, Midland, Odessa, Pampa

THE Bovaird SUPPLY COMPANY
GENERAL OFFICES
TULSA, OKLAHOMA

84 YEARS OF PROGRESS WITH THE OIL INDUSTRY

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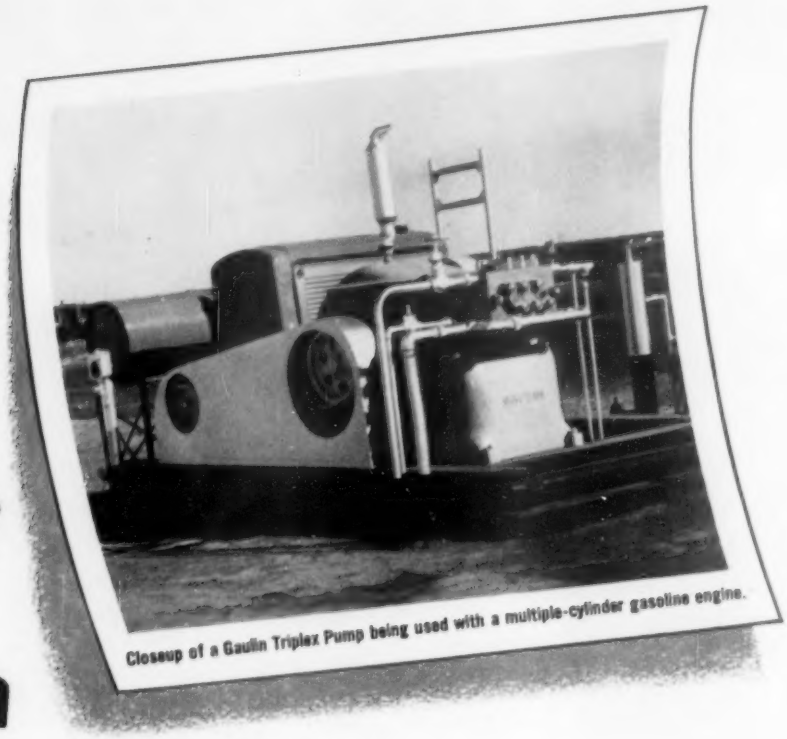


Closeup of a Gaulin Triplex Pump being used with a multiple-cylinder gasoline engine.

Month after Month, You know a GAULIN TRIPLEX PUMP

Subsurface Power Unit for Subsurface Hydraulic Pumping will keep on producing . . .

Write today — at no obligation — for your copy of the booklet that describes all of these Gaulin features:

Horizontal Design of power unit completely separates cylinder from crankcase, preventing any product leakage to crankcase. Cylinder assembly may be taken apart in minutes. Just lift cover and all parts instantly accessible for inspection or repair.

Plexiglas Well Covers give instant visual check of plunger and packing condition.

Corrosion-Proof Cylinder is made of stainless. Hardened stainless or ceramic plungers available.

Spring-Loaded Plunger packing is self-adjusting, self-sealing, eliminates the human element.

API Ball Valves and removable seats permit easy replacement in the field.

Wide Capacity and Pressure range easily, economically obtained by changing plunger size in the field.

CALL: **SPECIALTY SALES & SERVICE, INC.**
TULSA, OKLAHOMA — (TULSA 5-42226) ODESSA, TEXAS — (ODESSA 6-0921)

MANTON-GAULIN MANUFACTURING CO., INC.
LA HABRA, CALIFORNIA
M. LES WALRAVEN, MGR. OIL FIELD SALES (OXFORD 7-6334) (LONG BEACH 4-1596)

MANUFACTURED BY
MANTON-GAULIN
MANUFACTURING CO., INC.
73 GARDEN ST., EVERETT, MASSACHUSETTS

Gaulin

To Finance your Production ...See a Mercantile Man!

Whether you're engaged in exploration, lease rentals, drilling wells, building a pipeline, or refining crude, it all takes money. That's why members of our Oil and Gas Department suggest that you let them help you devise a workable plan of financing. Of course, they'll keep an eye on your tax requirements. This experienced team, with a working knowledge of oil and gas properties, provides field service advice; compiles and interprets essential statistical data; and helps you reach the sound decisions needed to make production pay. For a workable plan of financing, see a Mercantile Man.

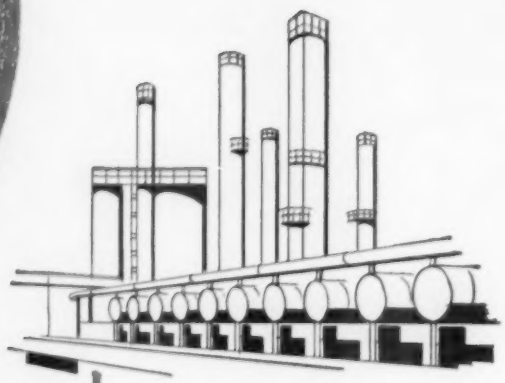
Mercantile National Bank

Dallas, Texas

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

here.....

a pressure drop is annoying



here.....

a pressure drop is expensive

IT PAYS TO LOOK AT THE ADVANTAGES OF USING B&W SEAMLESS WELDING FITTINGS

Welded Construction Takes Less Space — Piping can be nested in corners, or fitted against ceilings, walls or equipment. Dimensional accuracy permits cut-offs at odd angles when necessary.

Whole Sections Can Be Shop-Fabricated — For fast installation, or where working space is limited, entire sections can be shop-fabricated and installed by any qualified welder in a few minutes.

Welded Construction is Easily Insulated—Insulation is simplified by the absence of complex flanged assemblies. Because joints are leakproof, insulation is permanent and maintenance free.

Welded Construction is Permanent — Maintenance costs are kept at a minimum because piping is permanent and leakproof. The strength of the weld approaches that of the pipe itself.

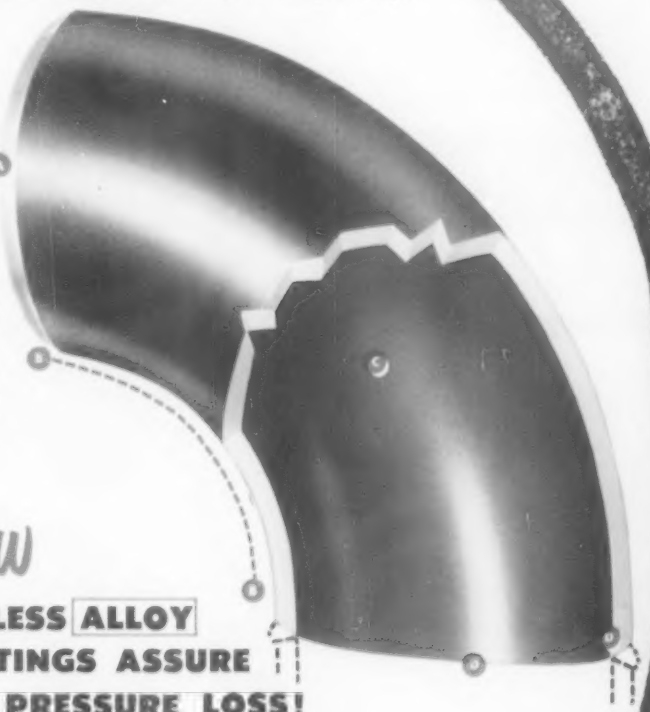
Welded Construction is Simple to Install—Dimensional accuracy of angles, radii, and bevels, assure quick and easy joining. Any qualified welder can do the job efficiently and economically.

Welded Construction is Lightweight — Strength combined with lightweight permits easy handling in installation. Unwieldy sections can be joined on the ground, and then fastened into position.

District Sales Offices: BEAVER FALLS, PA. • BOSTON 16, MASS. • CHICAGO 3, ILL. • CINCINNATI 6, OHIO • CLEVELAND 14, OHIO • DETROIT 26, MICH. • HOUSTON 19, TEX.

COMPARISON PROVES THE PRACTICALITY OF B&W WELDING FITTINGS

These 4 factors increase friction, create turbulence and consequent erosion and cause pressure drop. Note how they are eliminated with welded construction using B&W Alloy Welding Fittings.



A CIRCULARITY — True circularity throughout insures accurate alignment when special odd-angle sections are cut. Full diameter throughout protects against pressure loss due to flattened or angular surfaces.

B RADIUS—Uniform gradual change of direction provides smooth even flow — less resistance to directional changes.

C SMOOTH INNER WALLS—No waves or ridges within the fitting to impair flow — no buckling of metal along the short inner curve — no stretching on the outer curve. This also prevents premature piping system failure.

D SMOOTH JOINTS — Uniform wall thickness, machined bevel ends, and perfect agreement between fitting and pipe sizes assure automatic and perfect alignment. The smooth welded joints present no interruption to flow.

here's how

B&W SEAMLESS ALLOY WELDING FITTINGS ASSURE MINIMUM PRESSURE LOSS!

Welding Fittings remove all "road blocks" from the flow of material. They present a gentle transition in contour, smooth inner walls free of pockets or crevises within the joints. Flow of material is speeded, erosion due to turbulence is minimized adding years to the life of the piping system.

This efficient piping flow reduces maintenance costs, reduces pumping power requirements and investment in equipment.

B&W Seamless Welding Fittings

GRADES: Carbon, Alloy and Stainless Steels.

TYPES: Elbows, Tees, Caps, Saddles, Laterals, Nipples, Returns, Flanges, Stub Ends, Reducers, Crosses, Bull Plugs.

SIZES: Complete range of sizes and schedules.

THE *NATURAL* SOURCE FOR ALLOY FITTINGS

B&W TUBULAR PRODUCTS DIVISION

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION • FITTINGS DEPARTMENT
3839 WEST BURNHAM STREET • MILWAUKEE 46, WISCONSIN

FA-5901

LOS ANGELES 17, CAL. • MILWAUKEE 46, WIS. • NEW YORK 16, N. Y. • PHILADELPHIA 2, PA. • ST. LOUIS 8, MO. • SAN FRANCISCO 3, CAL. • SYRACUSE 2, N. Y. • TULSA 3, OKLA.

Severns Drilling Company of Southern California, are making more hole with their National drilling rig—recently repowered for them by the Frazier Wright Company of Los Angeles, with three Waukesha Gas Power Units — Model LRZBU, six cylinder, 9⅛-in. bore x 8½-in. stroke, 3520 cu. in. displacement (shown below, right).

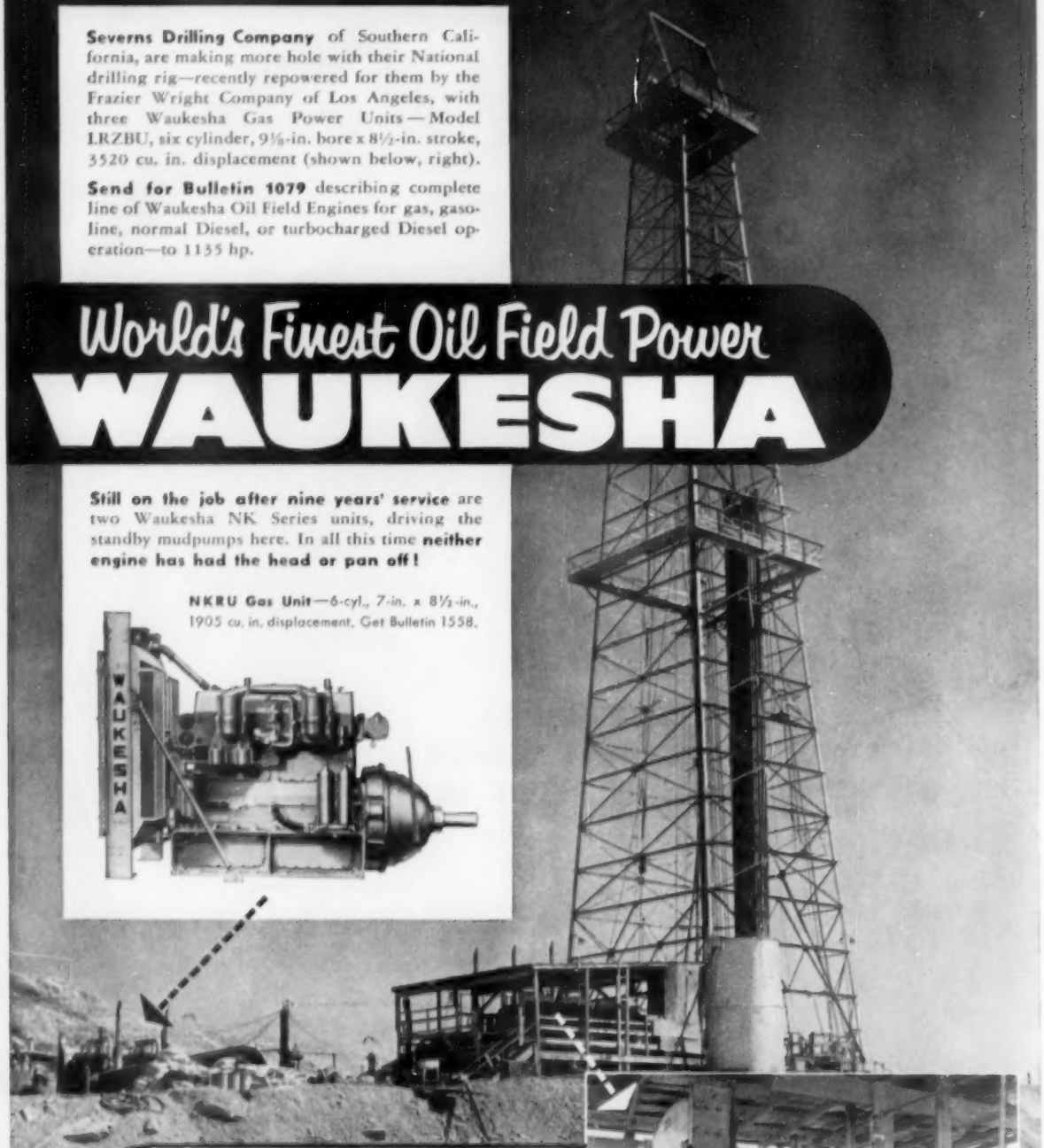
Send for Bulletin 1079 describing complete line of Waukesha Oil Field Engines for gas, gasoline, normal Diesel, or turbocharged Diesel operation—to 1135 hp.

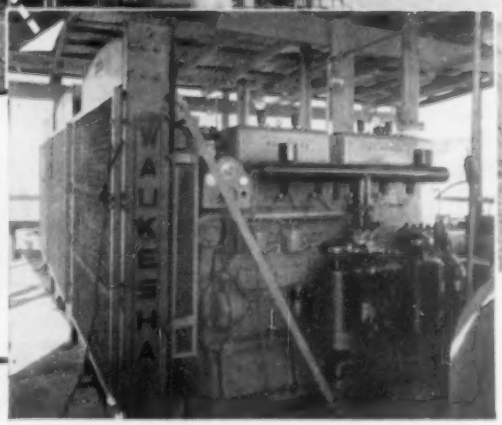
World's Finest Oil Field Power

WAUKESHA

Still on the job after nine years' service are two Waukesha NK Series units, driving the standby mudpumps here. In all this time **neither engine has had the head or pan off!**

NKRU Gas Unit—6-cyl., 7-in. x 8½-in., 1905 cu. in. displacement. Get Bulletin 1558.





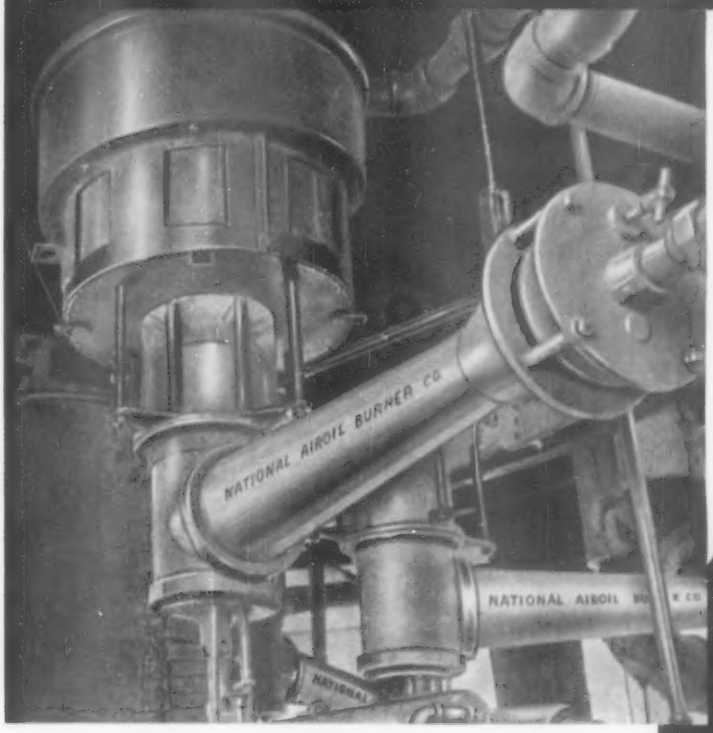
LRZBU Waukesha Gas Unit has counterbalanced crankshaft and aluminum pistons; on butane or propane it delivers 550 hp max. at 1200 rpm. Maximum load for intermittent duty is 495 hp; for continuous duty, 440 hp at 1200 rpm. With 1000 Btu natural gas, hp ratings are about 10% less. Units have renewable, wet cylinder sleeves; 7-bearing 5½-in. crankshaft; overhead valves, Stellite-faced exhaust valves with Stellite seats; full pressure oiling; precision bearings; full flow oil cooler; and every modern post-war improvement for reliability and long life. Send for Bulletin 1481.

274

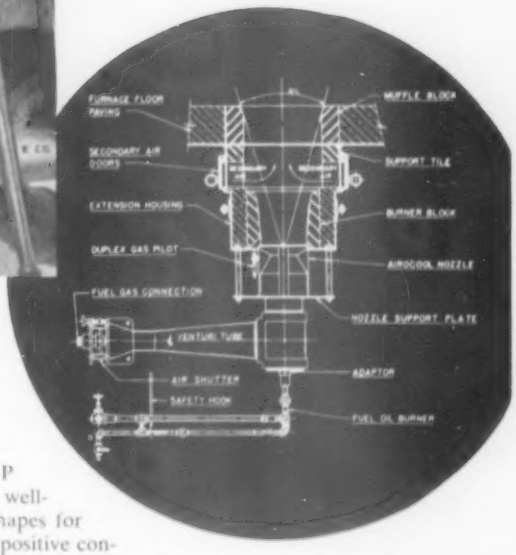
WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.

New York • Tulsa • Los Angeles

Designed for VERTICALLY FIRED PETROLEUM HEATERS



NATIONAL AIROIL VERTICAL Oil-Gas Tandem Combustion Units



many more hours on stream, without forced shutdown

Exclusively for vertical firing, National Airoil VERTICAL C-P Tandem Block Units retain all the features of our regular well-known Tandem Units . . . plus: special pre-cast refractory shapes for easier installation and maintenance; secondary air louvres for positive control of flame pattern; and an all steel duplex detaching gear which enables swift, easy, oil burner removal.

VERTICAL C-P Tandem Units hold air in the combustion zone until fuel and heated air are thoroughly mixed. This means that ignition takes place in a hot zone; the result: high fuel economy through more rapid combustion with a minimum of excess air. NATIONAL AIROIL's patented Tandem Combustion Blocks allow secondary air to be easily and accurately controlled. By adjusting air control louvres, flame can be shaped to radiate heat uniformly without tube impingement.

ALL VERTICAL Tandem Units are fired with NATIONAL AIROIL Combination Oil and Gas Burners . . . have a high turn down ratio with steady flames . . . maintain high flame temperatures using either fuel oil or gas. With the C-P TANDEM UNIT's clean flame, a cold furnace can be brought to full capacity in a shorter time.

"Many, many more hours on stream, without forced shutdown" . . . yes, YOU will realize high profits from YOUR heaters when National Airoil C-P VERTICAL Tandem Units are specified. Our new folder 498 is yours for the asking.

CHEMICAL-PETROLEUM DIVISION

NATIONAL AIROIL BURNER CO., INC.

Main Office & Factory: **1236 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PA.**
Southwestern Division: 2512 South Boulevard, Houston 6, Texas
INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

STILL HEATER
FEED TO PRODUCT EXCHANGER
PROPANE VAPORIZER • NATURAL GAS COOLER
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STABILIZER NAPHTHA COOLER • SOLUTION COOLER
BLOWDOWN EXCHANGER • GASOLINE COOLER
FUEL OIL HEATER
BUTANE COOLER
OIL COOLER
GAS OIL COOLER • AIR HEATER
FEED PREHEATER • ABSORPTION OIL COOLER
VAPOR HEAT EXCHANGER • CAUSTIC SOLUTION COOLER
GASOLINE HEATER • DIETHYLENE GLYCOL EXCHANGER • INLET GAS COOLER
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GASOLINE TO COLD OIL EXCHANGER
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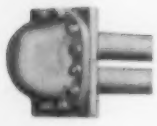
PREHEATER

Proved by 350,000 Years of Service



DOMED SHELL COVER—an exclusive Twin G-Fin Section feature provides streamlined return flow

More than 70,000 installed G-R Twin G-Fin Sections with an average operating period of well over 5 years have totaled a length of service which far exceeds that of any other sectional design of heat exchanger.

And what has this unique record demonstrated? It has conclusively proven the effective design and lasting construction of these units, originated by Griscom-Russell more than 25 years ago. It has also shown that the Twin G-Fin Section is the *universal* heat transfer apparatus—operating with complete success as a cooler, heater, condenser and heat exchanger for a wide range of fluids. And it has provided Griscom-Russell with an unequalled experience and wealth of performance data that assure the most authoritative recommendations and reliable ratings on this type of unit.

Write for Bulletin 1400 describing the G-R Twin G-Fin Section in detail.

3-PART END CLOSURE—an exclusive feature of Twin G-Fin Sections—far superior and simpler than in any other design of sectional unit

G-R
HEAT TRANSFER APPARATUS

THE GRISCOM-RUSSELL CO.
MASSILLON, OHIO
A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

Twin G-Fin Section

PUMP STRIPPER WELLS MORE PROFITABLY—

WITH Carter

LONG-STROKE HYDRAULIC PUMPING UNITS-

• Designed • Built • Priced FOR STRIPPER WELLS

featuring the LONG, SLOW UPSTROKE and VARIABLE CYCLE which provide increased production — reduced Sanding Up — greater overall efficiency — longer life and low maintenance costs!

Actual records show that in many cases installation of Carter Units has caused substantial production increases. Long, slow upstroke and fast downstroke of Carter Units permit pumping at *nearly constant flow and with greatly improved overall efficiency.*

Some of the specific advantages Carter Pumping offers you are:

- Accurate control of pumping rate.
- Maximum production without pumping off or pounding fluid.
- Longer life for sucker rods and subsurface equipment.
- Reduction of costly downtime.
- Better handling of gassy, sandy or viscous fluids.
- Low first cost. Prices competitive with conventional mechanical equipment.
- Easily maintained by regular field personnel because of extreme simplicity of design and construction.
- No concrete foundation usually necessary
- Qualified representatives for sales and service are located at convenient points throughout the oil country.

With over 800 units now in service, some for as long as eight years, *the Carter method is increasingly recognized* by both majors and independents *as the better way to produce stripper wells.*

Available in Eight Models to suit your specific requirements.

WRITE for Bulletin PR-355

S. C. CARTER CO , Inc.
1900 Santa Fe Avenue
Los Angeles, California

SALES and SERVICE REPRESENTATIVES

ILLINOIS, INDIANA and KENTUCKY—Bradford Supply Company, Robinson, Salem, Ill.; Princeton, Evansville, Ind.; Irvine, Oil Springs and Owensboro, Ky. KANSAS, OHIO, and WEST VIRGINIA—Beckett Supply Company, Arkansas City, Chase, El Dorado, Great Bend, Wichita, Kansas; Wooster, Zanesville, Ohio; Vienna, W. Va.; MICHIGAN—The Straker Supply, Mt. Pleasant. OKLAHOMA—A. D. Larson Supply Co., Oklahoma City, Duncan; G & G Machine and Equipment Co., Houston. ARKANSAS, LOUISIANA, NEW MEXICO and TEXAS—Wilson Supply Company, Harvey, Houma, Lake Charles, New Iberia, Shreveport, La.; Alice, Barbers Hill, Bay City, Beaumont, Columbus, Corpus Christi, Houston, Kilgore, Liberty, Monahans, and Victoria, Texas; Beasley Supply Company, Borger, Pampa, Texas. ROCKY MOUNTAIN AREA —Swan Specialties Co., Casper, Wyo.; Emrich Oilfield Management Co., Conrad, Montana. EXPORT: COLOMBIA and VENEZUELA—Weiss, S. A. Caracas, Maracaibo and Puerto la Cruz. CANADA—LeGrand Ltd., Calgary; TRINIDAD—Wilson and Johnstone Ltd., Port of Spain.

for MODERN refineries

TWO NEW *unitized* VACUUM TANKS

Self-contained, Made Ready for Your Mounting on Your Truck

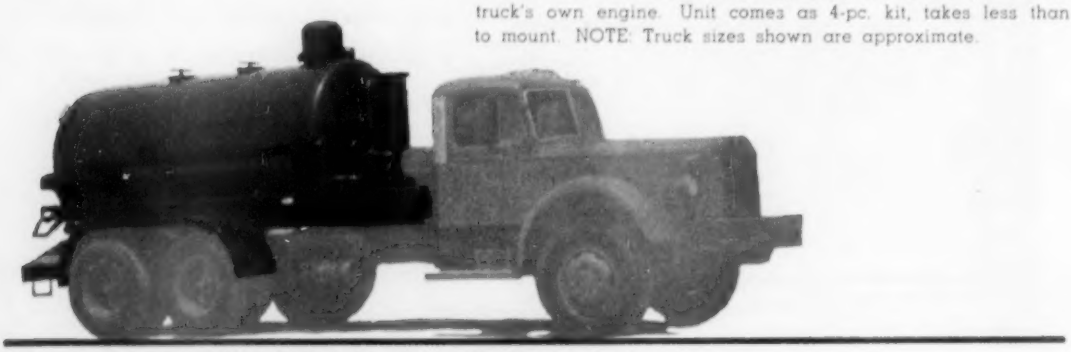
NOW! THOMPSON ANNOUNCES these two, new ready-to-mount vacuum tanks, engineered especially for modern materials-handling in modern refineries.

They give you the same, sure efficiency of Thompson UVT plus the low-investment advantage of mounting on your own truck.

TAKES THESE TOUGH-TO-HANDLE REFINERY JOBS IN STRIDE--

Coil-cleaning in cracked fuel tanks
Cleaning caustic and leveled tanks
Cleaning cooling tower basins
Cleaning wax out of tanks
Cleaning separator boxes
Cleaning run-down tanks
Handling catalyst slurry
Unplugging drain lines
Cleaning drain boxes
Cleaning crude tanks

Model ST is available in 7 sizes: The 30, 35, and 40 bbl. units fit a 2-axle truck with 153" wheelbase and 84" CA; the 45, 50, 55, and 60 bbl. sizes fit a 3-axle truck with 175" wheelbase and 102" CA. (55 and 60 bbl. units are for off-highway use.) Power-pump take-off is from truck's own engine. Unit comes as 4-pc. kit, takes less than a day to mount. NOTE: Truck sizes shown are approximate.



Model WT comes in 40, 45 or 50 bbl. capacities. Mounts on truck with 193" wheelbase, 120" CA. Has own gasoline engine and pump. One-piece unit takes less than half-a-day to mount. NOTE: Truck size shown is approximate

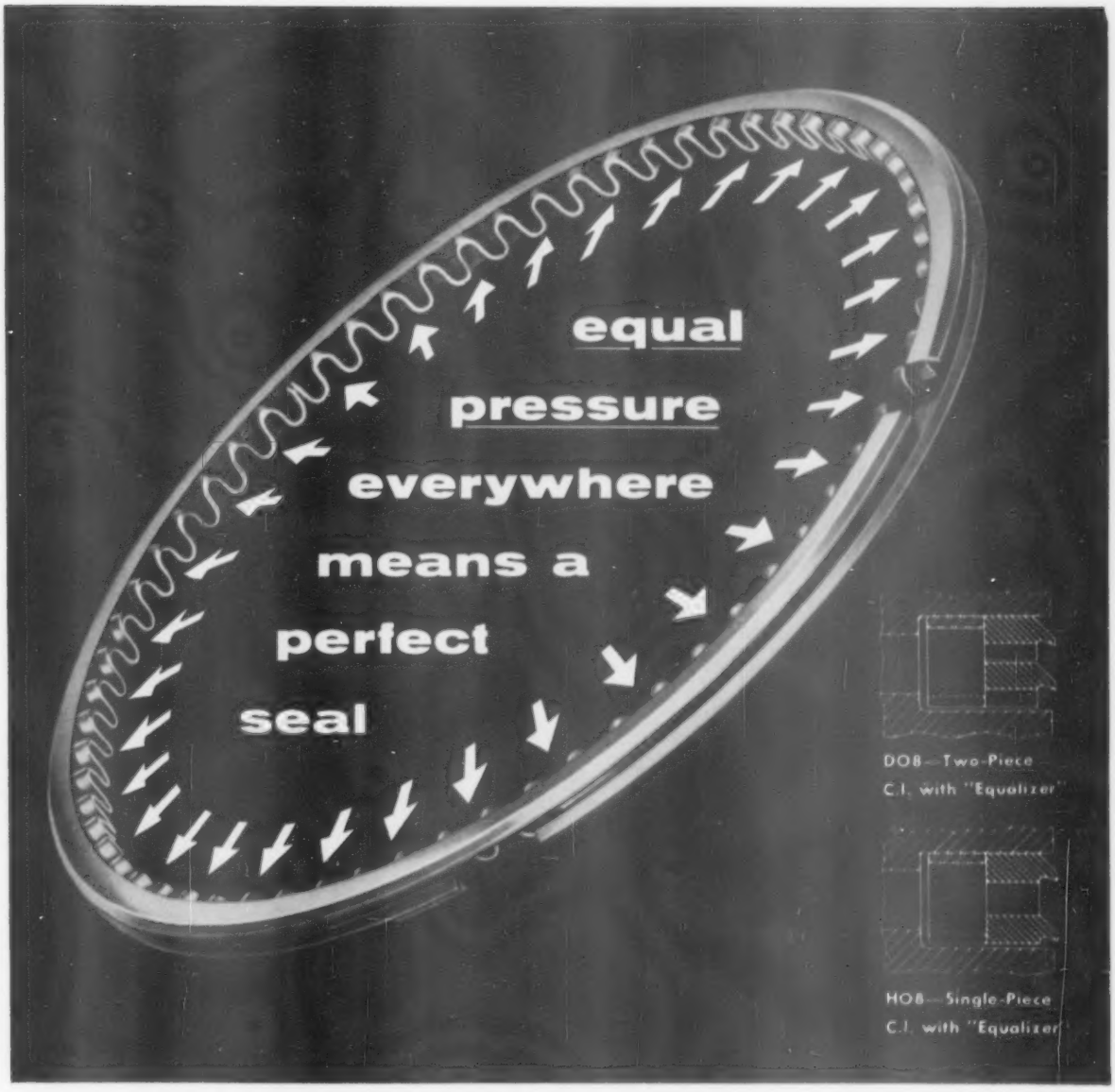
SOLE LICENSEE TO MANUFACTURE VACUUM TANKS UNDER U. S. PAT. NO. 2522077

THOMPSON
Tank & Manufacturing Co., Inc.
2019 East Wardlow Road, Long Beach 7, California

WRITE FOR SPECIFICATIONS

Complete with blueprinted mounting instructions furnished. If you'd like to see Thompson UVT's at work, we'll tell you where, in your area, you can watch them save time and money — pay for themselves time and again. Write today!

EXPORT: COLOMBIA and VENEZUELA—Wales, S. A. Caracas, Maracaibo and Puerto la Cruz.
CANADA—LeGrand Ltd., Calgary. TRINIDAD—Wilcox and Johnstone Ltd., Port of Spain.



PEDRICK PIONEERED CONFORMABLE OIL RINGS

A perfect seal, with uniform oil control for diesel and gas engines! Pedrick achieved it with the original *conformable* oil ring.

This is the design that made it possible: Two thin, flexible cylinder contacting sections are kept under absolutely uniform tension by the Pedrick "Equalizer." This exclusive feature provides a soft but positive and uniform pressure *all around the cylinder wall*.

The exceptional conformability makes possible more effective oil control with less unit pressure or ring friction. Cylinder and ring wear are reduced and engine overhaul periods are extended. Oil control stays constant for tens of thousands of hours. Carbon pollution is all but eliminated.

Whatever your requirements . . . single rings or engineered sets, it will pay you to insist on Pedrick. Engineering service is available to help you with special problems. Write, phone or wire: WILKENING MANUFACTURING CO., Philadelphia 42. SAratoga 9-3770.

Pedrick PISTON RINGS

PEDRICK PRECISIONEERING KEEPS PEDRICK FIRST

"SPUDDING IN" ON 51ST STREET

Even though hole is finally made in Southwest United States or in neighboring Canada, initial planning and financing may well have taken place in the heart of Manhattan.

The modern building of the Empire Trust Oil and Gas Department at Rockefeller Center houses an oil banking and advisory staff exclusively concerned with the financing problems of your industry. If you want expert advice on financial matters, or need funds to carry out worthwhile projects, come to the Empire Trust Company. We're here to serve you.

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Trade Mark Reg.
U. S. Pat. Off.

precision-made
BOLTED STEEL TANKS

MASTER-CRAFTED BY
COLUMBIAN
SINCE 1893

Just watch a crew erect a Columbian master-crafted tank. You'll discover the secret of Columbian's tightness and lasting strength in the speed with which the crew joins the accurately formed, precision-punched plates and decks with minimum straining or hammering. The real strength of any steel tank lies in the hands of the men who make it...and Columbian prides itself on more than 60 years of master craftsmanship in fabricating steel. Whatever tank size you need, wherever you locate it, you can depend on Columbian for top quality and speed—in both delivery and erection.

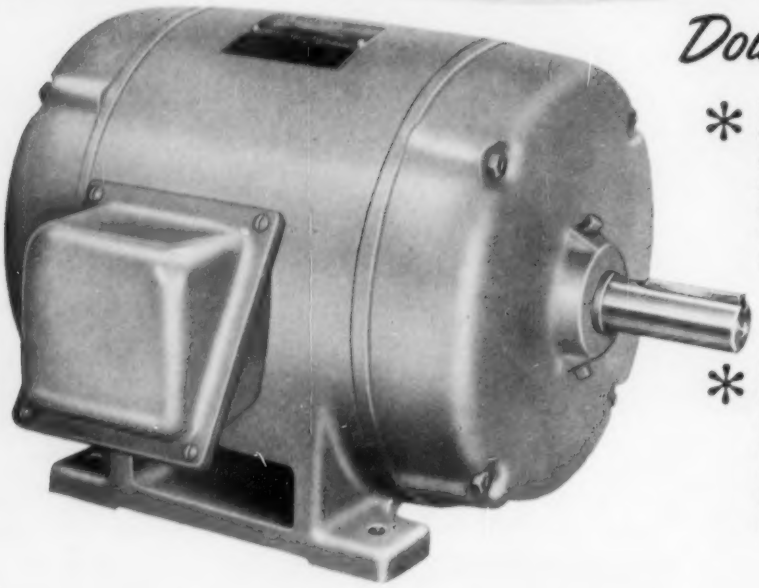
IN THE FIELD OR AT THE PLANT, you can't do better than a rigid, strong, fire-safe Columbian Metal Building — for pumphouse, storage, warehouse, garage or equipment. Easily, quickly erected with accurately fitting sectional panels. Write for full details.

COLUMBIAN Steel Tank Co. P. O. BOX 4048-J, Kansas City, Mo.

STEEL, Master-Crafted by Columbian... First for Lasting Strength

Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

NEW!
Wagner Type DP* Motors
Doubly Protected



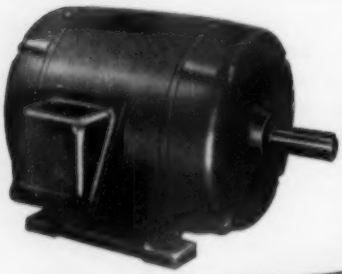
* Wagner Type DP Motors are protected by rugged, corrosion-resistant cast iron frames, smoothly rounded so that no moisture can collect on them. Motor feet are cast as an integral part of the frame for maximum strength and rigidity.

* Enclosures are drip-proof plus! Air intakes are located at the bottom of the endplates — air outlets are located at the base of the frame, one on each side. Specially designed baffles provide protection for the stator windings.

The Wagner line of polyphase, drip-proof general purpose motors—rerated to the new NEMA Standards—pack more power into smaller frames, but give you the same high Wagner Quality and long life performance that have made Wagner Motors "the choice of leaders in industry" for many, many years. These new Wagner Motors are fully protected in the ball bearing models. Their construction makes them completely drip-proof — and virtually splash-proof. The extra large, diagonally split conduit box makes wiring easy. Smaller size and lighter weight means more economical handling and installation.

These new rerated Wagner Motors retain the features desired by plant engineers and maintenance men. They will operate for years without regreasing. But . . . when lubrication *is* necessary or desirable, you *can* lubricate these motors because they are provided with two lubrication openings.

Bulletin MU-202 gives full information—write for your copy today.



FULLY PROTECTED OIL WELL PUMPING MOTORS
POLYPHASE OR SINGLE PHASE

These motors are protected three ways—against rain, snow, or sand by dripproof enclosures; against reptiles or rodents by screened ventilating openings; against corrosive alkalies or acids by cast iron construction.

You can look to Wagner for a complete line of standard motors for specialized applications. The wide range of types and sizes permit the selection of a standard motor for almost any need.

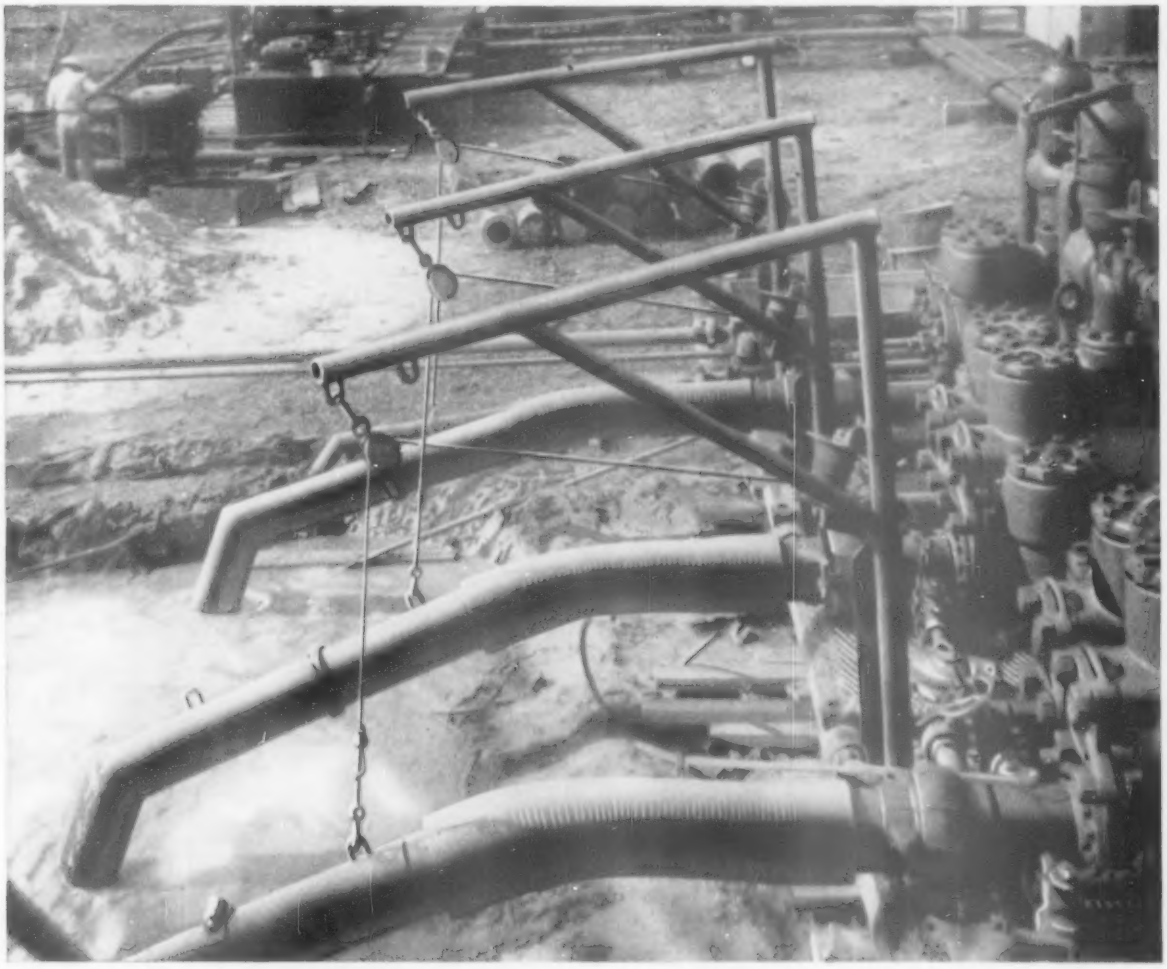
Wagner Electric Corporation
6389 Plymouth Ave., St. Louis 14, Mo., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

M55-6A

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS-AIR AND HYDRAULIC

Trade Mark Reg.
U. S. Pat. Off.



here's photographic proof . . .
you get better service with REPUBLIC MUD PUMP HOSE!

● A close look at this photograph reveals these facts:

(1) All equipment is *dry,* although no cumbersome clamps hold the hose in position. There are no leaks; no lost pumping pressure.

(2) Hose covers are not puckered at the bottom nor stretched at the top of the hose bends. The hose curves smoothly without stress or strain.

(3) No cuts or worn spots are evident, yet this Republic Hose has seen long service on this and other jobs.

Other features, not visible here, include special smooth bore, abrasion-resisting tubes and strong, flexible round-wire helix reinforcements that prevent collapse from suction.

Add up the facts and we think you too will want Republic Mud Pump Hose working for you —*AND SOON!!!* 6, 8, 10 and 12-inch sizes are available through your local Republic Distributor.

Stocked in the Mid-Continent Area by
JONES & LAUGHLIN STEEL CORPORATION, Supply Division
P.O. Drawer 2481, Tulsa 2, Okla.
and the J & L Store
in YOUR field.

REPUBLIC RUBBER DIVISION
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405 Towne Ave., Los Angeles, Calif.
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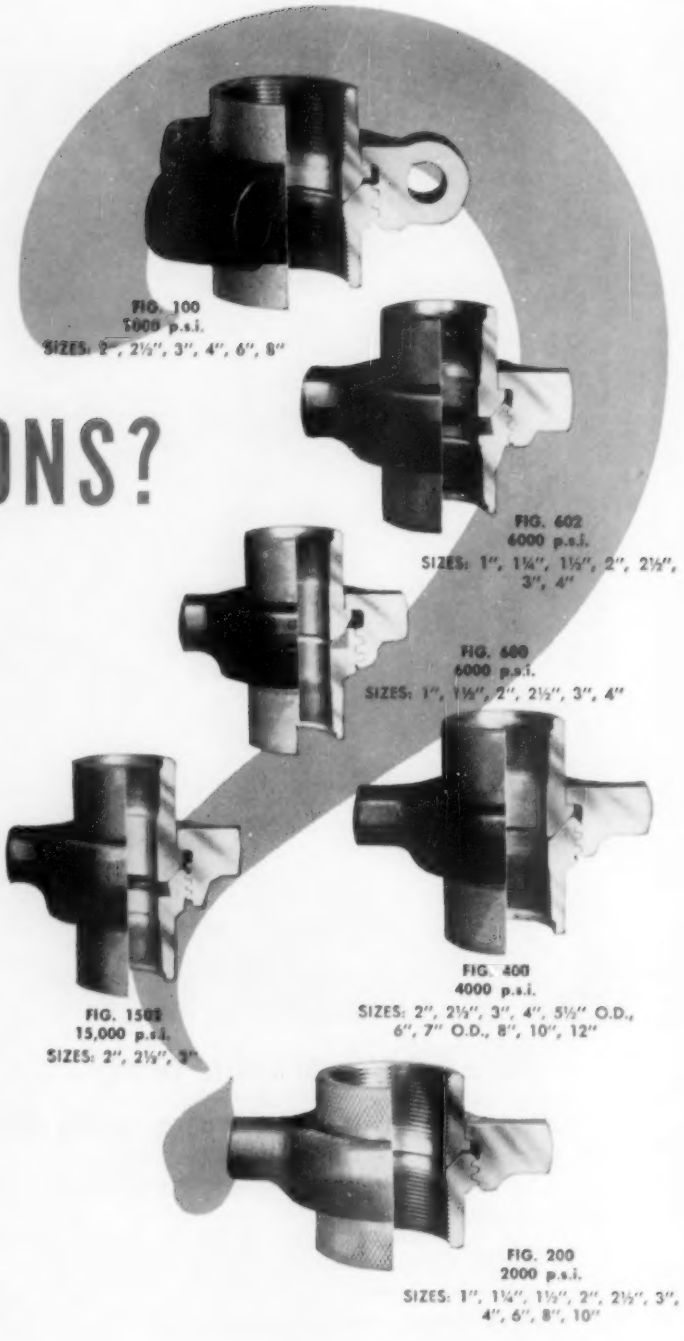
WHY is it WISE to Standardize with WECO UNIONS?



• *Here is a trio of time-and-cost-trimming reasons:*

INTERCHANGEABILITY . . .

All WECO Union parts are interchangeable in the same size and pressure rating with complete assurance of a leak-proof seal. On lines that are made-up and broken-out repeatedly this, particularly, is a great time and cost cutter.

SERVICEABILITY . . .

The famous ball and cone seat . . . the tough Acme Threads . . . the rugged extra duty wing nut and heavier wall sections have made WECO Unions synonymous with service: long-lasting, leak-proof service you can trust on job after job.

AVAILABILITY . . .

WECO's wide range of unions in sizes from 1" to 12" — in pressures from 1,000 to 15,000 p.s.i. — assures you the right union for every job. And they are as close as your nearest supply store — wherever oil is drilled or produced.

• *Whenever you need unions, see for yourself why it is wise to Standardize with WECO.*

U-8-55

PESA

it's wise to standardize with.. **WECO**

WECO

WELL EQUIPMENT MFG. CORP. • Division of Chikson Company • HOUSTON 1, TEXAS

OLD PELTON NO. 1—1939

REDUCING LIFTING COSTS FOR 15 YEARS with PELTON

1939 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55

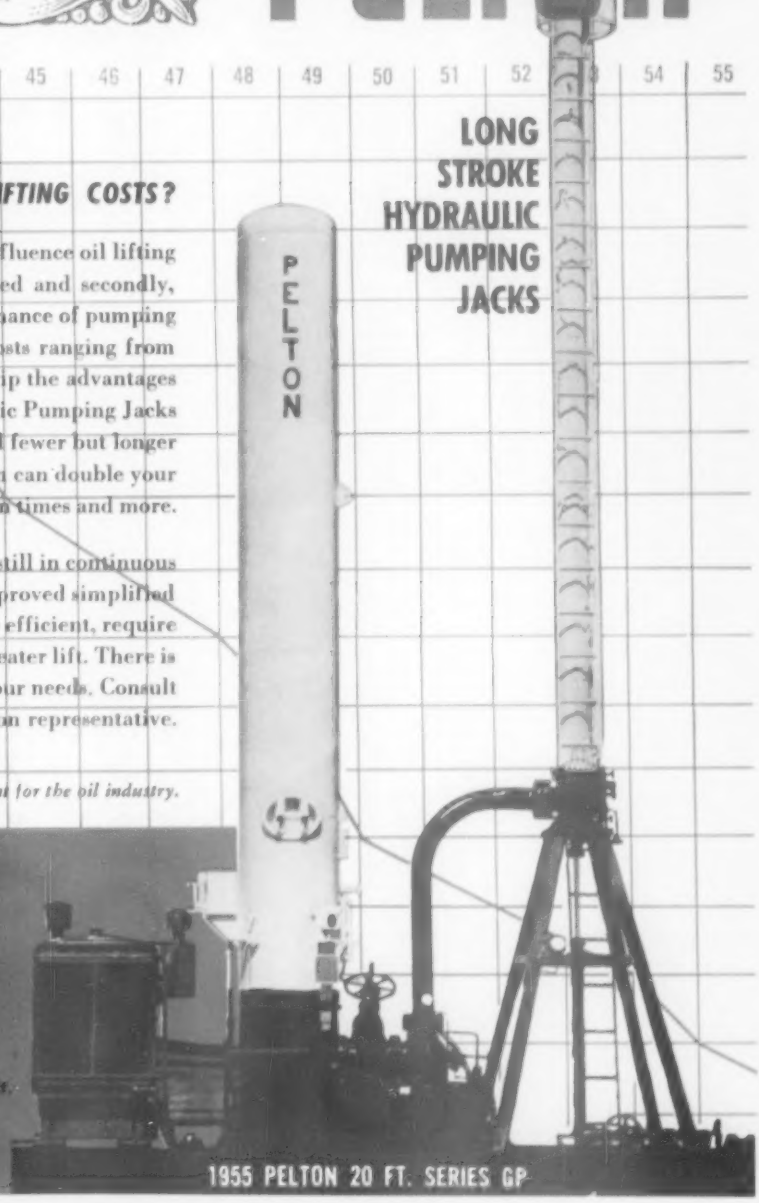
WHAT ARE YOUR LIFTING COSTS?

Two principal factors greatly influence oil lifting costs. First, the volume of oil lifted and secondly, the initial cost and maintenance of pumping equipment. With well servicing costs ranging from $400.00 to $1,200.00 per round trip the advantages of Pelton Long Stroke Hydraulic Pumping Jacks with their soft rod reversals and fewer but longer strokes are apparent. Pelton can double your production and prolong rod life ten times and more.

Old Pelton No. 1 shown above is still in continuous service after fifteen years. Improved simplified present day models are more efficient, require less servicing and produce a greater lift. There is a Pelton unit adaptable to your needs. Consult your local Pelton representative.

Pioneers in hydraulic pumping equipment for the oil industry.

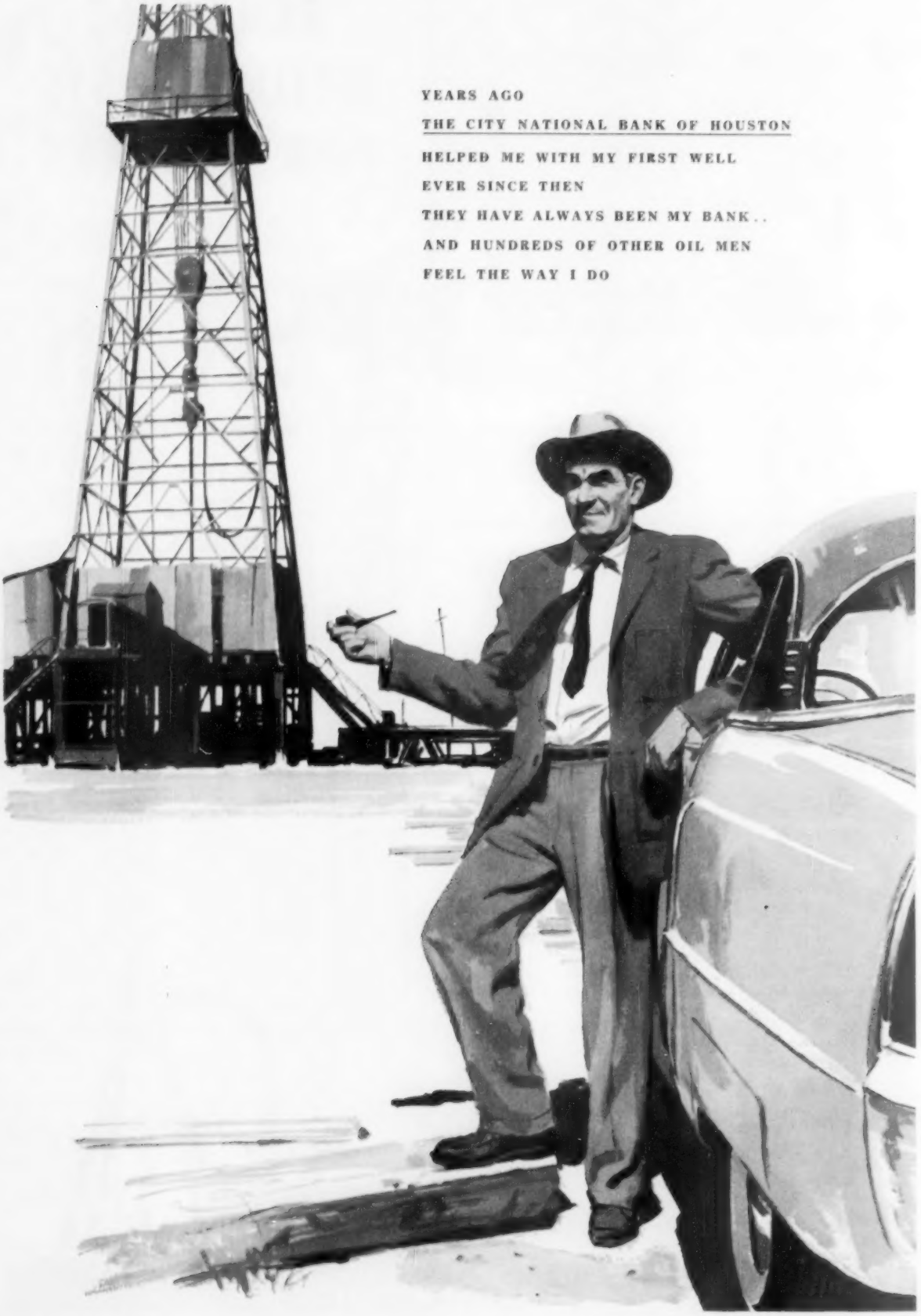
LONG STROKE HYDRAULIC PUMPING JACKS



1955 PELTON 20 FT. SERIES GP

PELTON
WATER WHEEL COMPANY
Subsidiary of
Baldwin-Lima-Hamilton Corp.
Oil Industry Machinery Division
2447 East 54th Street, Los Angeles 58, Calif.
Los Angeles—San Francisco—Avenal—Dallas
Houston—Odessa—Hobbs—Tulsa—New York City

YEARS AGO
THE CITY NATIONAL BANK OF HOUSTON
HELPED ME WITH MY FIRST WELL
EVER SINCE THEN
THEY HAVE ALWAYS BEEN MY BANK..
AND HUNDREDS OF OTHER OIL MEN
FEEL THE WAY I DO



ACROSS THE CONTINENT. . . .

R. H. FULTON & CO.

CONTRACTORS

LUBBOCK, TEXAS

- Product Pipelines
- Oil Lines
- Water Pipelines
- River Crossings
- Gas Pipeline Construction

drilling structure consultant...

To give you the professional help you need in your drilling structure problem — Lee C. Moore has a complete staff of experienced consultants who are strategically located to be on quick call.

A. B. Dunham is one of these important men who help you solve your drilling structure problems. With headquarters at Midland, Texas, he puts his 15 years experience to work in that area.

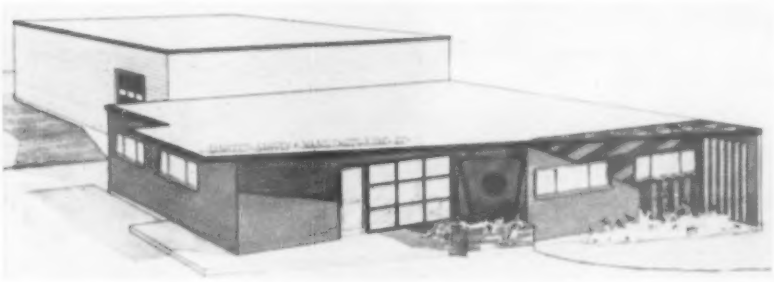
An experienced team of Lee C. Moore engineers is ready to help you with your special design problems — or the application of standard equipment.

LEE C. Moore CORPORATION

TULSA DALLAS HOUSTON MIDLAND SHREVEPORT WICHITA CENTRALIA PITTSBURGH

EXPORT OFFICE: ROOM 624 INTERNATIONAL BLDG., 630 5TH AVE., NEW YORK 20, NEW YORK

EQUIPMENT MEN . . . in the News



United Supply to Build Facilities at Houston

United Supply & Manufacturing Co. has begun construction on this new office and oil-field-supply store and warehouse in Houston. H. B. Gutelius, Jr., president of United Supply, says that the modern new store will give United more office space and more efficient storage and handling of oil-field supplies in the Houston area. C. G. King is vice president in charge of the Houston office. V. A. Lieder is store manager.

Reed Roller Bit Shifts Hall to Houston Office

HAROLD HALL

The transfer of Harold Hall, sales engineer for Reed Roller Bit Co., to company's Houston office was announced by W. L. Childs, sales manager for the oil-tool division of the company. Hall has recently returned from a 2-year assignment in Venezuela and Colombia. He will be attached to Reed's Houston office but will travel throughout the company's sales divisions on assignment.

A. O. Smith Announces New Smithway Dispenser

Wm. G. Moser, manager, Meter Products, A. O. Smith Corp., has announced the new 1955 Smithway gasoline dispenser. Modern styling of the new dispenser is designed to build station business by catching the motorist's eye.

The new dispenser is only 57 in. high, yet it offers all the mechanical advantages available in larger dispensers. Within the top canopy are concealed lights which illuminate the dial face, the entire front and back of the dispenser, and the island on which it stands.

Representatives of the petroleum industry have already attended a preview of the pump and shipments are being made from the company's factories at Los Angeles and Succasunna, N. J.

Fluor Moves Metal Products Department to Paola, Kans.

All metal-products-department offices and engineering personnel of The Fluor Corp., Ltd., have been transferred from Los Angeles to the company's recently expanded manufacturing plant in Paola, Kans. The move is in line with Fluor's program to consolidate pipe prefabrication and metal-products fabrication in Paola.

Fluor's original pipe prefabrication facilities were set up in 1940 to expedite the supplying of refinery and gasoline-plant piping to the company's construction projects throughout the Mid-Continent. Since that time, due primarily to the strategic location of Paola, those activities have since been expanded to include the manufacture of pulsation dampeners and heavy-duty mufflers, plus the prefabrication of high-pressure piping and the fabrication of pressure vessels and miscellaneous structural steel.

Lane-Wells Makes Lynch Assistant at Bakersfield

Dennis A. Lynch has been appointed assistant district superintendent for Lane-Wells Co.'s Bakersfield district, it was announced by William J. Taylor, district superintendent.

Lynch has been with Lane-Wells Co. since 1946. He joined Lane-Wells as rigman in the Bakersfield area. His later service included well-logging and

Goulds Pumps Concludes Pump School at Tulsa

The Tulsa district office of Goulds Pumps has just concluded a 2-day pump school. It was conducted by C. L. Forshee and Eugene Schwandt, engineers from Goulds' home office in Seneca Falls, N. Y., with the assistance of Homer Plowman and Jack McDonald, sales engineers in the Tulsa office. This school was put on to introduce new lines of pumps, and as a refresher course in pump fundamentals.

Attending the school were (seated): Ken Cusick, James S. Kone & Co.; James S. Kone, James S. Kone & Co.; J. P. Lonberger, Goulds Pumps; E. Genereux, Joplin Supply Co.; and E. Gulick, Joplin Supply.

Second row: Bud Fink, Forslund Pump & Machinery Corp.; Ed Turner, Bruce Co., Inc.; David Stoufer, Bruce Co.; Homer Plowman, Goulds Pumps; E. Schwandt, Goulds Pumps; and R. L. Bratcher, Forslund Pump & Machinery Corp.

Third row are: Walter Loeffler, Federal Corp.; Dick Keister, John A. Rhodes Co.; L. P. Argenbright, The Mine & Smelter Supply Co.; J. W. Butler, O'Bannon Brothers; H. J. McDonald, Goulds Pumps; and Boy Beard, O'Bannon Brothers.

Practical service training at Honeywell's school . . .

makes your instrument men more valuable

Your instrument maintenance men can get a real education in the most up-to-date methods for servicing instruments, at Honeywell's Training School. Any organization which uses Honeywell instruments can send maintenance personnel to this school. Tuition costs you nothing, for this school is maintained as a "plus-value" service to Honeywell customers.

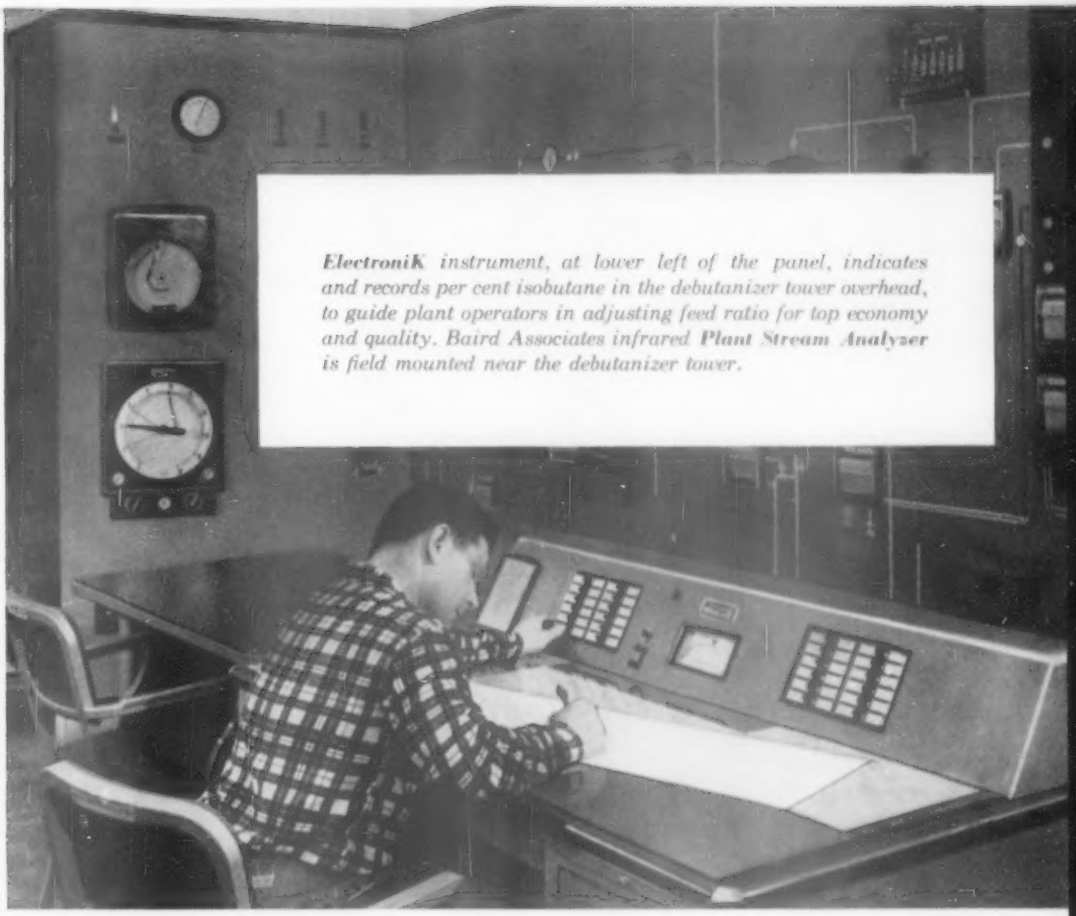
Thousands of technicians have either started or augmented their instrument knowledge here. A variety of courses is available, to fit men for the particular kind of maintenance problems they may encounter in their specific jobs. The comprehensive course . . . one of the most complete and intensive offered anywhere . . . covers about thirteen weeks. Other courses cover five weeks and less, to offer condensed instruction of either a basic or "refresher" nature to men who can't be spared for extended periods.

There's nothing academic about this school. The emphasis is placed on practical knowledge. Theory through lectures and textbook study is liberally supplemented by laboratory sessions and actual bench work on all types of instruments and related equipment.

One caution: classes have to be limited to assure thorough attention to all students, so make reservations in advance. Your local Honeywell office will be glad to make arrangements. Call today . . . it's as near as your phone.

Sohio refinery cuts isobutane loss $35,000 yearly by

View of the new alkylation unit at the Toledo refinery of Standard Oil Company (Ohio).



ElectroniK instrument, at lower left of the panel, indicates and records per cent isobutane in the debutanizer tower overhead, to guide plant operators in adjusting feed ratio for top economy and quality. Baird Associates infrared ***Plant Stream Analyzer*** *is field mounted near the debutanizer tower.*

continuous end point analysis

THROUGH the use of continuous infra-red analysis, Standard Oil Company (Ohio) has substantially improved operating economy in the two alkylation units at the Toledo refinery. Annual savings, on the basis of reduced isobutane loss, amount to $35,000 per installation . . . a return of 500 percent on the instrumentation investment!

The objective of end point control is to maintain the proper ratio of feed of isobutane to butylene. Low ratio will reduce yields and quality . . . high ratio causes excessive loss of isobutane in the debutanizer overhead. Conventional control, applied to environmental conditions such as temperature, flow, and pressure, could not correct for changes in feed composition. To provide a direct means of watching isobutane loss, a Baird Associates "Plant Stream Analyzer," with an *ElectroniK* recorder, was installed.

A portion of the debutanizer overhead stream passes continuously through the analyzer, using a carefully designed sampling system. The analyzer is sensitized to isobutane, and produces an electrical signal representing isobutane content. On the unit's central control panel, an *ElectroniK* instrument records per cent isobutane on a direct-reading chart. At a glance, operators can see exactly the excess isobutane going to storage . . . and can make appropriate changes in feed streams.

This basic idea can be put to work on scores of processes to give continuous checks on quality of product . . . and often to initiate automatic control based on product analysis. In automatic analysis systems of varied types, *ElectroniK* instruments afford the peak in accuracy, dependability and sensitivity essential to full realization of the potential benefits of end point control.

For a discussion of applications to your specific control problems, contact manufacturers of the numerous fine analyzing equipment on the market . . . or call your local Honeywell sales engineer. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

REED *Super Shrink-Grip* TOOL JOINTS GIVE NEARLY TWICE THE AVERAGE FOOTAGE IN CALIFORNIA

W. G. Simpson, Drilling Superintendent, Clyde Hall Drilling Company

CLYDE HALL
DRILLING COMPANY

Contract Oil Well Drilling

2543 South Union Avenue
Telephone FAirview 4-9724

Box 107, Station B
BAKERSFIELD, CALIFORNIA

March 12, 1955

Mr. J. L. Carraway
Reed Roller Bit Company
1330 30th Street
Bakersfield, California

Dear Mr. Carraway:

We are pleased to report the following data on a string of 4½" drill pipe in service for approximately four years.

This string of pipe was equipped with 4½ x 6" O.D. F.H. Reed Super Shrink-Grip tool joints and we have drilled approximately 240,000 feet of hole before having them replaced.

We are also users of Reed flash welded tool joints. Our service from Reed flash welded joints is outstanding, the same as with Reed Super Shrink-Grip.

Yours very truly,

CLYDE HALL DRILLING COMPANY

By W. G. Simpson
W. G. Simpson

WGS:hp

This 240,000-foot service life of Reed Tool Joints is nearly twice the usual life of tool joints in California where 4½" hardfaced tool joints normally can be used for only 100,000 to 175,000 feet of hole.

Your Reed salesman will gladly show you records of outstanding Reed Tool Joint service in your area.

REED ROLLER BIT COMPANY
HOUSTON 1, TEXAS

THE MARK OF QUALITY

Gulf Coast, Mid-Continent, Rocky Mountain and Canadian Distributor for Martin-Decker Products

truck-station operation. Prior to his appointment as assistant district superintendent, Lynch had been working out of the Bakersfield branch as an operator and maintenance technician.

Baker Transworld Announces Canadian Staff Changes

C. J. TAYLOR

Baker Oil Tools, Inc., on behalf of its subsidiary in Canada, Baker Transworld, Inc., has announced the following personnel changes and additions.

Clifford J. Taylor, formerly division sales engineer in the Mid-Continent division, becomes division manager with headquarters in Calgary.

HAUTZINGER

L. R. THORNE

Roy K. Hautzinger, active in Canadian oil industry affairs for 15 years, continues as sales representative in the Edmonton area. Lyall R. Thorne, with 18 years' experience serving the Canadian oil industry, is now sales representative, stationed in Edmonton.

J&L Opens New Store In Estevan, Saskatchewan

A store was opened for business in May in Estevan, Sask., by Jones & Laughlin Supply Division. It is the sixth J&L supply store in Canada. The new store will serve such fields as Midale, Frobisher, Alida, Steelman, Ratcliffe, Lampman and Pierson.

The Estevan store will be under the supervision of H. L. Wilkins, manager of J&L Supply Division operations in Canada. H. C. King, from the sales office in Regina, will assist in sales promotion in the Estevan area. Local store management will be in the hands of M. D. McAfee, assisted by salesman R. D. Spenst and storeman Ronald C. Kellington.

Rainey Elliott, president of J&L's Supply Division, said the Estevan store will specialize in the sale and maintenance of pumping equipment and will house a well-equipped Axelson pump repair shop. Sales personnel will in-

PLS-Monmouth Junction, N. J.
At Your Service in the East!

Just 16 miles from
U. S. STEEL CORPORATION'S
New Pipe Mill
at Fairless, Pa.

One of 7 Key Locations

PROVIDING THE MOST MODERN FACILITIES FOR COATING and WRAPPING STEEL PIPE

To serve eastern customers, this modern PLS plant at Monmouth Junction, New Jersey, covers 26 acres, with 60,000 square feet under cover—just 16 miles from U.S. Steel Corporation's new pipe mill at Fairless, Pa. and only 40 miles from New York City. At this strategic location, PLS specialists are always ready to give you the benefit of their long experience and latest mechanical equipment in protecting your steel pipe.

Here, as at all the other modern PLS plants, you can expect more for your money in quality cleaning, priming, coating and wrapping. It's a promise backed by years of dependable performance.

DEPENDABLE SERVICE SINCE 1931

PLS Pipe Line Service Corporation

Pioneers in Steel Pipe Protection
General Offices and Plant: Franklin Park, Illinois

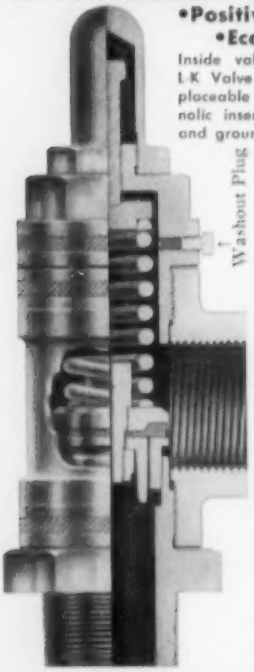
Plants at Glenwillard, Penna.; Longview, Texas; Corpus Christi, Texas; Harvey, La.; Sparrows Point, Md.; and Monmouth Junction, N. J.

WORKING SCALE MODEL of a Lee C. Moore drilling rig (above) is shown at Tulsa Crating Company where a special crate was designed and engineered to transport it to oil shows and conventions throughout the country. Specializing in Precision Engineered crates and packaging for both domestic and export shipping, Tulsa Crating Company has had over 35 years experience. No item is too big or too small, too delicate or too heavy for the crating specialists at Tulsa Crating Company. One of their departments specializes in the maze of customs regulations that complicate export shipping. No matter what your crating problem is . . . call Tulsa Crating Company, 519 South Rockford, Tulsa, Oklahoma, Phone 3-6482 or 3-3492.

(Adv.)

L-K RELIEF VALVE

•Positive •Simple •Economical



Inside valve uses regular L-K Valve design with replaceable laminated phenolic insert and hardened and ground steel seat and heavy duty steel body.

2" and 2½" carried in stock. Other sizes can be furnished quickly on receipt of order.

Bakelite Valve insert will not "freeze" on hardened steel valve seat.

For extremely high pressures, L-K Relief Valves are of similar design but of heavier construction and slightly different arrangement of interior. For gas, air or vapors, L-K Relief Valves are of similar design but with special ball insert.

See our pages in the Composite Catalog

L-K PUMP VALVE CO.

P. O. Box 901 Houston, Texas

clude a factory-trained man to service Cabot pumping units.

McEvoy Names Hutton as North Texas Sales Engineer

M. C. Hutton has been appointed sales engineer in the sales and service department of McEvoy Co. He will serve the North Texas area with headquarters in Sherman, Tex.

Hutton was previously associated with an oil-tool company in that area for a number of years. He is thoroughly familiar with oil-industry problems and personnel, particularly the drilling and production phases. He has just completed a preliminary training course in McEvoy's Houston plant.

Edward Valves Makes Oweiss Permian Area Sales Engineer

W. A. OWEISS

The appointment of W. A. (Bud) Oweiss as West Texas-New Mexico sales engineer for Rockwell-built Edward valves has been announced by W. F. Crawford, president of Edward Valves, Inc., subsidiary of Rockwell Manufacturing Co.

Oweiss started to work at Edward in 1952, and completed the regular Edward 2-year training program. He also helped supervise the building of the Edward Valvemobile, a large mobile valve-display truck which is currently touring the country visiting valve buyers and users. He conducted the Valvemobile on its initial tour through the Southwest. More recently, Oweiss has been helping to introduce the new Rockwell-built Edward Mudwonder mud-line valve in the oil fields of West Texas.

Food Machinery, Chemical To Acquire Chiksan Co.

B. C. Carter, executive vice president of Food Machinery & Chemical Corp., has announced that his company's offer to acquire the common stock of Chiksan Co. has been accepted by holders of more than 93 per cent of the outstanding shares of Chiksan common stock.

Accordingly, the acquisition of Chiksan Co. by Food Machinery & Chemical Corp. will be consummated in ac-

ENGINEERS · DESIGNERS · FABRICATORS · MACHINISTS

JOE STINE, INC.

HOUSTON, TEXAS

THERE IS NO SUBSTITUTE FOR *EXPERIENCE!*

•

Complete facilities for all type fabricating-machining requirements.

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6022 Chocolate Bayou Rd.
P. O. Box 14471
HOUSTON 21, TEXAS

this marks a **VICTOR** *stud...*

a dependable fastener

where high tensile strength, resistance to creep and fatigue is necessary at high temperatures.

Ask for the new VICTOR Catalog.

VICTOR PRODUCTS CORP.

2635 W. BELMONT AVE. • CHICAGO 18, ILL.

Grip-Tite

Gauge Line Wiper

Saves Time

Installed in Hatch Hole

Cleans both line and bob. Eliminates many gauging hazards. Wiper is below hatch. Oil dripping from line falls back into tank. Saves cleaning and painting jobs. Does not interfere with thiefing. Rigid construction. Replaceable insert made of oil resistant Hycar rubber.

GRIP-TITE MANUFACTURING COMPANY

P. O. Box 45 Marshall, Texas

Export: R. S. Stokvis & Sons, Inc., 17 Battery Place, New York, N. Y. Calif. Repr.: Leonard Price, 249 E. 23rd St., Los Angeles, Calif.

Wherever You Operate... Depend On SECOND NATIONAL

In the field or in their office . . . oil and gas men have come to rely on Second National for a wide variety of services. Services only an "Oil Minded" bank such as Second National can offer.

Second National's Oil and Gas Department is staffed by engineers and geologists with practical experience in all phases of petroleum and gas development. They have current statistical files available for your use. These friendly specialists are glad to consult with you concerning oil loans.

So wherever you operate—in the field or in your office—make use of this complete banking service designed exclusively for oil and gas men by Second National.

New PRODUCTION HISTORY of 18 Principal Oil Producing Formations

Write for Second National's new *"Production History of the Principal Oil Producing Formations in Arkansas, Louisiana, Mississippi, New Mexico, and Texas."* Basic data includes: area of proved acres; production through 1952; average production thickness in feet; total recovery per acre and per acre foot, plus other important information. Yours, free for the asking.

48 Years of Service to the Southwest

SECOND NATIONAL

Bank of Houston

CAPITAL AND SURPLUS 20 MILLION DOLLARS

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

GUIBERSON'S IMPROVED TYPE H1 ANCHOR

features

GREATLY REDUCED SLIP WEAR

TYPE H1 ANCHOR

Here is the anchor most widely used by oilmen everywhere — now, with a great new feature. Stainless snap rings hold the slips in retracted position while going in yet have no effect on holding power of the anchor. This new feature gives far longer slip life because slips do not drag the casing wall. Slips with the snap ring are interchangeable on all Guiberson H1 anchors.

There is nothing on the market that will excel Guiberson's Type H1 Hydraulic Anchor for holding down any packer. It *automatically* sets when pressure in tubing overcomes casing pressure. We recommend it for holding down your packer in acidizing, fracturing or other below packer pressuring operations. It holds equally well in any direction.

Simplicity of design and completely automatic operation make the H1 exceedingly easy-running, easy-pulling. Case hardened piston slips in monel inserts assure positive action and maximum corrosion resistance. H1 anchors are individually tested and will hold any pressure the tubing will stand.

See this improved Type H1 Anchor for yourself. Use it on your next completion or workover. Write for data, sizes and prices.

THE

GUIBERSON

CORPORATION

ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

Sold By Leading Oil Field Supply Stores Everywhere

cordance with the terms of the exchange agreement.

Swartz Is Sales Engineer For Southwest Industries

C. H. SWARTZ

Charles H. Swartz has joined Southwest Industries, Inc., Houston manufacturer of packaged gas-compressor plants, as a sales engineer, Jay Cannon, president, has announced. "Swartz' background in the gas and gasoline department of Gulf Oil Co. will be helpful to customers of Southwest Industries," Cannon said. While with Gulf, Swartz was active in the design, construction, and operation of gas compressor stations and natural-gasoline plants. He has done additional work in gas dehydration as well as all phases of gas-compression work.

Chiksan Expands Sales Development Department

G. R. Winder, vice president and general sales manager of Chiksan Co., Brea, Calif., has announced the appointment of James L. Emerson to fill the newly created post of assistant to the manager of the firm's sales development department under E. N. Thomas.

Emerson will devote the major part of his time to Chiksan's advertising and promotion program.

Ed Styron Joins General Controls' Field Staff

ED STYRON

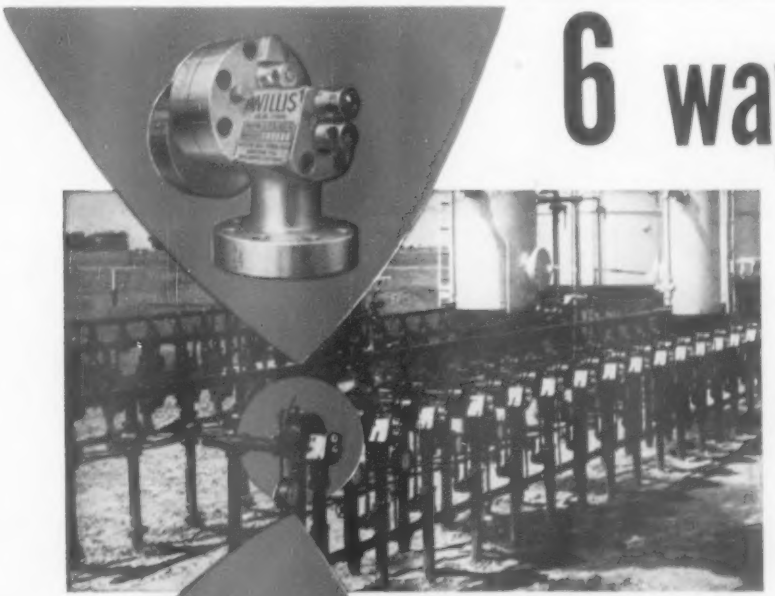
Ed Styron, a veteran of 20 years' sales experience in instruments and control engineering in the oil industry, has joined General Controls Co. of Glendale, Calif., as a field representative, it was announced by J. F. Ray, vice president in charge of sales.

In his new post, Styron will specialize in industrial applications of controls. His control experience includes positions with the Jensen Instrument

HILLER DEVELOPMENTS ...speed you into the future

Now a major supplier of production and research aircraft to the military forces, work of Hiller Helicopters today will benefit commercial products of tomorrow.

HILLER HELICOPTERS
PALO ALTO, CALIFORNIA



An entire lease is controlled accurately and precisely in minutes through this battery of Willis Rotary Adjustable Chokes.

6 ways better

flow control

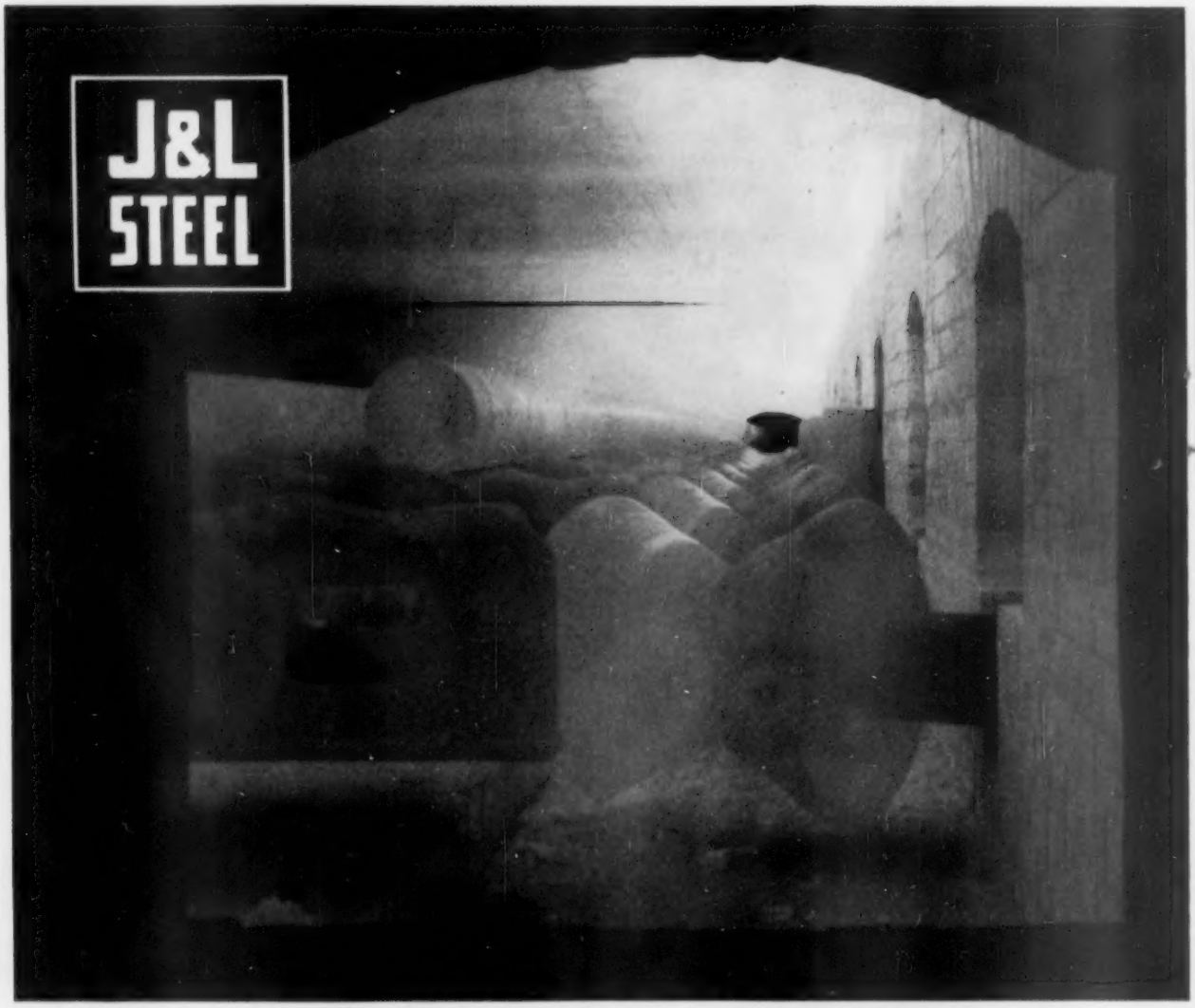
PROVIDES 6 different sized choke inserts which are individually positioned in the line of flow by a fractional turn of the orifice-carrying disc . . . under constant flow and high pressure.

The 6 graduated orifices are changed to a new range in minutes...without shutting-in the well.

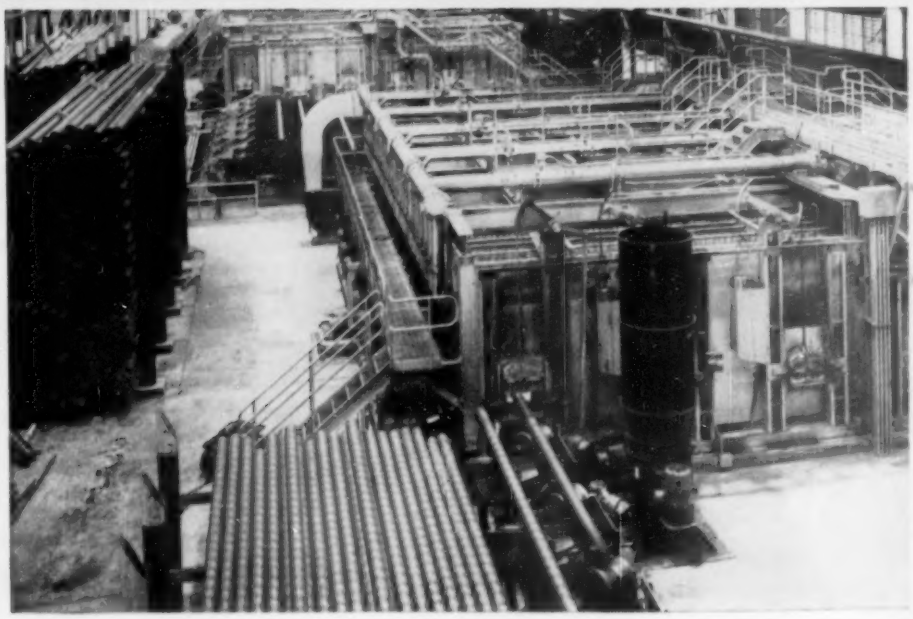
A positive shut-in is made by inserting a blank orifice.

WILLIS
Rotary Adjustable
CHOKES

WILLIS OIL TOOL COMPANY
3440 Pine Ave., Long Beach 7, California
Houston: 2012 Taft Street Odessa: 100 N. Texas Street



INTERIOR of high temperature 1650° F. furnace. The pipe moves through slowly from left to right on the conveyorized furnace bottom, passes out the exit door in the background.



OVER-ALL VIEW of J&L's new Seamless Tube Specialties Department at Aliquippa, Pa. High strength seamless steel pipe progresses automatically from the feed table in the foreground, through the heat treating furnaces in the center of the picture and into straightening, cutting and threading machines.

MORE HIGH STRENGTH CASING

J&L installs unique hearth type furnaces and quenching unit to meet driller demand

Drillers' growing need for an increased proportion of high strength steel casing is being met by J&L Steel through the addition of new facilities for the production of oil country tubular products.

Called the "Seamless Tube Specialties Department," the newest addition employs equipment of J&L design . . . makes possible the finishing of oil country casing by a quench and temper heat treatment that produces characteristics formerly attained through adjustments in the chemical composition of the steel. The result: by speeding up and improving its finishing facilities, J&L can furnish deep well drillers with more high strength casing up to 110,000 p.s.i.

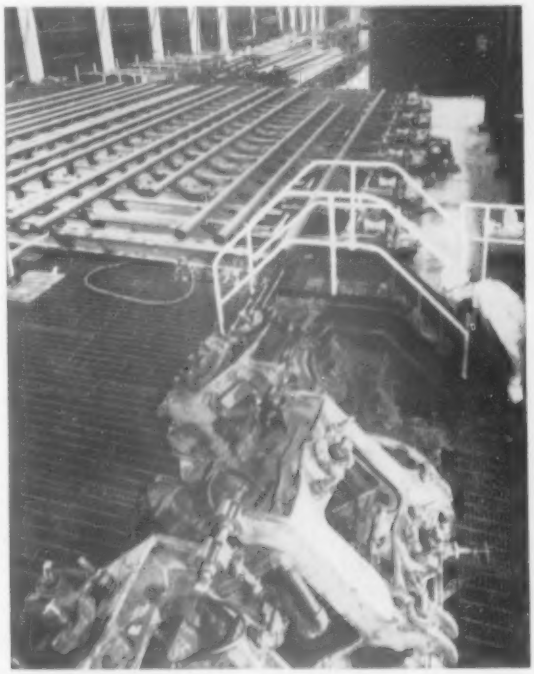
If you're concerned with deep well drilling, J&L offers you a dependable source of high strength material.

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

SERVING DRILLERS EVERYWHERE
LINKED BY WATER
TO THE MIDDLE WEST AND SOUTH

J&L STEEL

KENNETH NICHOLSON, turn foreman, checks 7-inch O.D. seamless oil well casing going into the No. 1 high temperature heat treating furnace. In this mechanically-operated, hearth-type, gas-fired furnace the pipe is normalized.



A THREE-STAND REDUCING MILL, foreground, at the exit end of the No. 2 tempering furnace, sizes the pipe to exact diameter. The No. 2 cooling bed in the upper left quarter of the picture moves and assembles the pipe for further processing.

When It Comes to Coupling Pipe

It Pays to Know the Facts About

GUSTIN gb BACON

What's the Big Advantage in G-B Couplings?

G-B couplings eliminate flanging, threading, welding. No special tools or skill required to install them. Result: Tremendous savings in installation time.

How Else Do They Save Money?

All G-B couplings are reclaimable. Also, with G-B couplings, every joint is a union. Makes it easy, inexpensive to take a line apart.

How Much Abuse Can They Take?

Because they permit end pull up to 102,000 and misalignment up to 7%, G-B couplings absorb shock, vibration, ground motion, expansion, contraction, etc.

Are They Recommended for Permanent Installations?

Thousands and thousands of G-B couplings installed years ago on permanent lines, buried and exposed, are still giving completely satisfactory service.

What Kind of Lines Are They Used On?

Oil, water, chemicals, gases, air, processing fluids, abrasive materials. Permanent or temporary lines, surface or buried, vacuum, suction or discharge, vertical or horizontal.

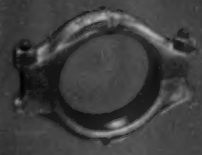
ROLAGRIP

for plain end pipe, 1½" to 12", 1000 p.s.i.

GRUVAGRIP

for grooved pipe, ½" to 12", 1000 p.s.i.

GRUVAJOINT



for grooved pipe, 2" to 6", 500 p.s.i.

FITTINGS

for all Gruvagrip and Gruvajoint couplings

Get GUSTIN gb BACON Couplings at your supply store

GUSTIN-BACON Manufacturing Company

210 W. Tenth St. Kansas City, Missouri

Write today for brochure #55-N containing photos, specifications on all G-B coupling products, including aluminum couplings and fittings for grooved pipe

Co., Fluor Corp., and Minneapolis-Honeywell. He was also employed by Atlantic Refining Co. and Standard Oil Co.

Pacific Pumps Opens Philadelphia Office

Pacific Pumps, Inc., of Huntington Park, Calif., has opened a Philadelphia district office, according to A. F. Canada, sales manager for the firm's

J. J. COFFEY

J. W. McCORMICK

centrifugal-pump division. J. J. Coffey, formerly a sales manager in Pacific's New York office, has been appointed Philadelphia district manager.

The Philadelphia office will handle sales of centrifugal pumps for southern New Jersey and most of Pennsylvania, Delaware, West Virginia, Maryland, Virginia, and Washington D. C.

At the same time, Canada announced the appointment of J. W. McCormick as New York district manager.

McCormick, who has been associated with Pacific since 1941, was formerly assistant manager of the firm's centrifugal-pump office in New York.

Enterprise Engine Names Conway Advertising Manager

Michael E. Conway has been appointed advertising manager of Enterprise Engine & Machinery Co., subsidiary of General Metals Corp. Prior to joining Enterprise Conway had been advertising manager of Pacific Car, Seattle. He will be located in the company's main office in San Francisco.

Lindholm to Manage Crane's Valve, Fitting Department

George G. Lindholm, manager of the Chicago branch of Crane Co. since 1948, has been appointed manager of the company's valve and fitting department at its general office in Chicago.

He succeeds F. J. Wilkey, who has been named special representative of

Magcobar means more than mud alone...
it means...

THE INDUSTRY'S LARGEST PRODUCING FACILITIES

Stretching to all corners of North America, Magcobar production facilities have expanded year after year to provide the oil industry with an abundant source of drilling mud materials for the present and the future. To accomplish this steady production progress, Magcobar has reinvested a far greater percentage of its income in additional production facilities for the oil industry than any other mud company. The scope of Magcobar plants is shown in this composite drawing. All these resources are provided for oil operators so that wherever they drill, whenever they drill, they may be assured of the same high quality product. Look for the Magcobar Dealer sign when you need mud.

Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION
ONE OF THE DRESSER INDUSTRIES
HOUSTON, TEXAS

WE'RE PUTTIN' EVERYTHING WE GOT INTO THIS
THE NO. 1
ROCKY MOUNTAIN
OIL SHOW
CASPER • JUNE 23-26
NEW SERVICES!
NEW EQUIPMENT!
ENTERTAINMENT!

Crane's industrial sales division. Wilkey had headed the valve and fitting department since 1944.

Thomas D. Kelley has been appointed manager of the Chicago branch to succeed Lindholm. He has been manager since 1953 of the company's Cleveland branch.

Lindholm has been associated with Crane since 1919. He was assigned to the general office, the Chicago Works, the former Evanston and Northwest side branches, Louisville, railroad sales, and the Detroit branch before being named assistant manager of the Chicago branch in 1944.

National Geophysical Makes Boulware Vice President

R. A. BOULWARE

Robert A. Boulware, seismic supervisor of Canadian operations, has been elected a vice president of National Geophysical Co., Inc., according to an announcement made by John A. Gillin, president of the company. Boulware's career with National Geophysical started in 1943 as an observer. Later he became a computer, surveyor, and chief computer. In 1947 he was promoted to party chief. He was promoted to supervisor and transferred to Canadian operations of the company in 1949.

Houdry Forms Chemical Group to Sell Catalysts

Establishment of a new chemical division as a major step in a progressive expansion program was announced recently by Houdry Process Corp. The new division will manufacture and sell certain types of catalyst used in petroleum and chemical-catalytic processes.

Jack C. Dart of Moylan, Pa., manager of research and development and a member of the corporation's board of directors, was named manager of the chemical division by Chalmer G. Kirkbride, president of Houdry. Dr. Alex G. Oblad of Springfield, Pa., associate manager of research and development, succeeds Dart as manager of the corporation's research laboratories at Linwood, Pa., where increased impetus will be given to development of new and improved catalysts.

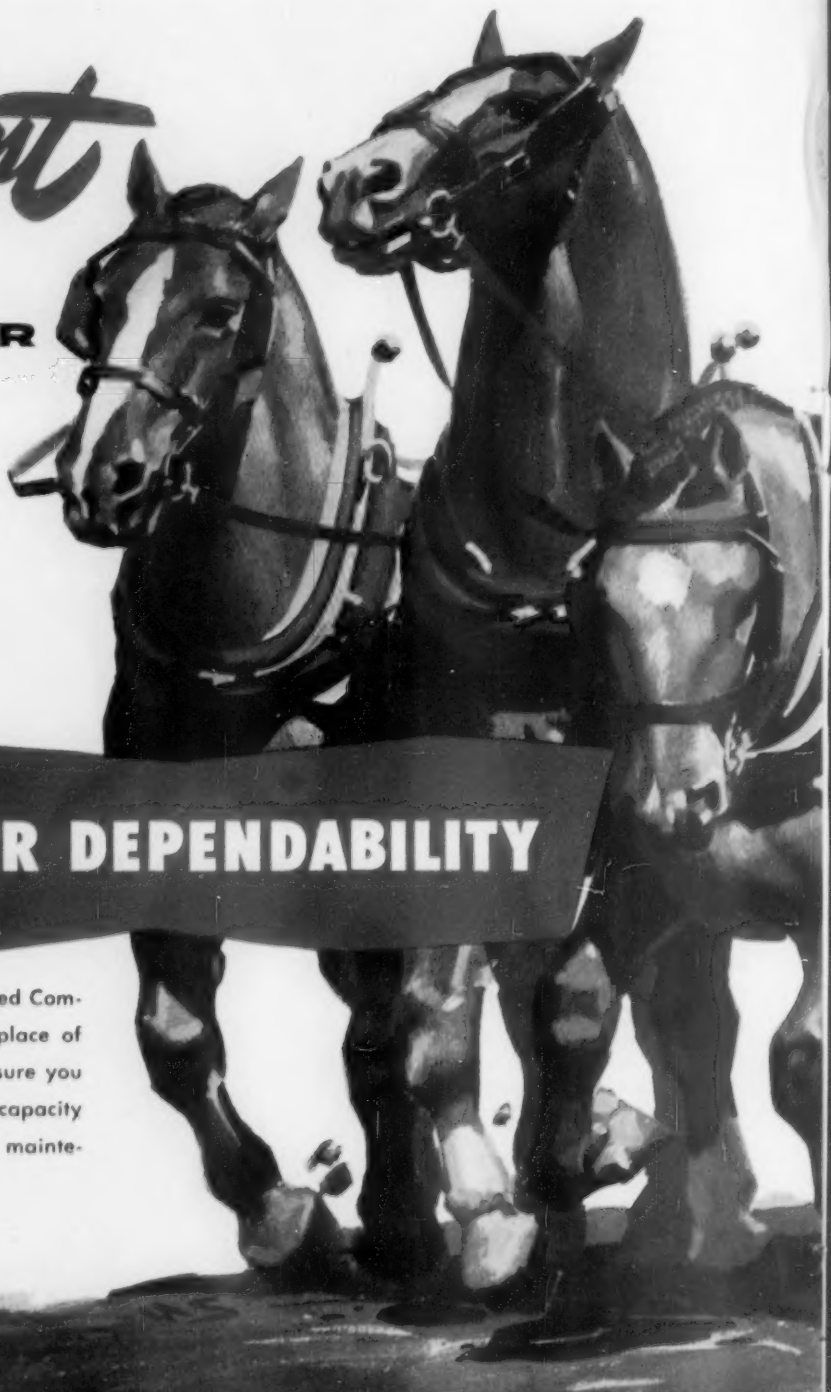
Ray Cross of Winona, N. J., manager of the Houdry catalyst-manufacturing plant at Paulsboro, N. J., becomes director of product manufacture of the chemical division. Howard D. Hartough, head of a research section on new petrochemicals and catalysts,

Otis – First In Pressure Control
OTIS
FIRST IN THE PETROLEUM INDUSTRY
Otis Method of Perforating and Cutting Off Tubing With Wire Line Under Pressure

Southwest

PACKAGED COMPRESSOR PLANTS

Bring Greater



HORSEPOWER DEPENDABILITY

Three 500 h.p. Southwest Packaged Compressor Plants, for example, in place of one 1500 h.p. stationary unit, assure you of two-thirds of total operating capacity even when one unit is down for maintenance.

*Featuring dependable, slow-speed Cooper-Bessemer engine driven compressors.

SOUTHWEST INDUSTRIES, INC.

Post Office Box 7773, Houston 7, Texas

becomes director of product sales and market development of the new division.

Well Equipment Names Wilson As Representative

D. M. WILSON

Donald M. (Don) Wilson has been appointed sales representative for Well Equipment Manufacturing Corp. in the Rocky Mountain area, according to announcement by John Gates, sales manager. Wilson will make his headquarters in Casper, Wyo. He became sales representative for the Fred Dewell Specialty Co. in 1952.

For the past 30 days, Wilson has been at the Weco plant in Houston studying the manufacture of unions, blocks, and compounds. In addition, Wilson will be sales representative for Chiksan swivel joints, steel rotary hose, mud guns, and other products in his territory.

De Laval Reveals Expansion Plans

An extensive long-range expansion program has been announced by De Laval Steam Turbine Co. Land has been purchased for future construction of new buildings anticipated in Trenton and Houston. In addition, specific building plans are already under way on land sites acquired near Chicago and San Francisco.

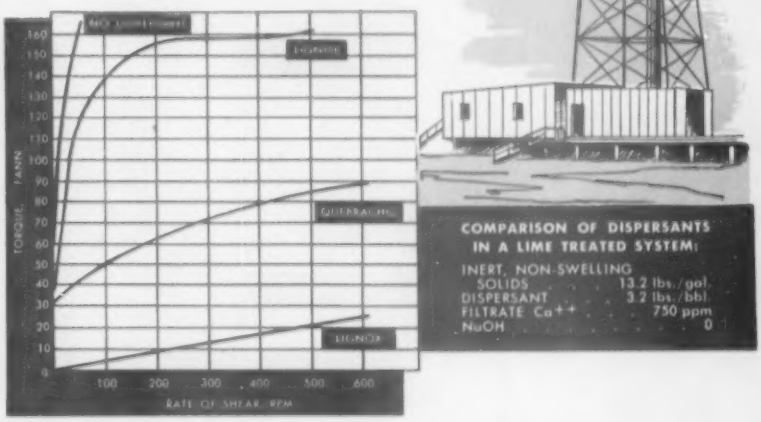
The announcement was made by J. P. Stewart, president. He stated that the expansion program is the outcome of a major survey begun in 1953. The survey included a study of company operations, future market conditions, and the sales potential of De Laval's present line of products and new products emerging from the company's research and development program.

Specific expansion plans outlined by Stewart involve 16.6 acres recently purchased adjacent to the existing De Laval plants in Trenton. A part of this area is already occupied by a building for the manufacture of high-pressure turbochargers for diesel and gas engines.

Another new building has been planned for erection in Forrest Park, Ill. It will be occupied by the sales and service division for De Laval's operations in the Midwest.

In Millbrae, Calif., near San Francisco, 2.6 acres have been purchased for a new plant of about 40,000 sq. ft. It is now under construction and is scheduled to be completed by August.

LIGNOX*
DISPERSES LIME TREATED MUD
...even without caustic!



The "mud" used to develop the curves shown here is not one you'd want to use for making hole. But in the laboratory it serves very well to illustrate the superiority of Lignox over other commonly used dispersants in lime treated muds.

*Lignox is a trade name for Marathon Corporation's neutral calcium lignosulfonate.†

It is the only lignosulfonate product proved by years of successful use in oil well drilling.

†patented

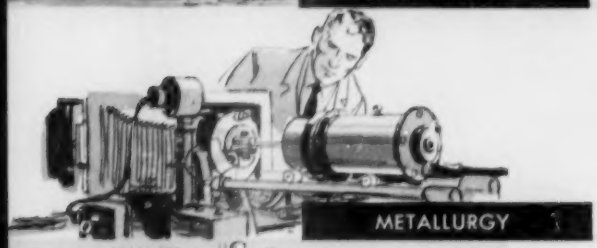
Note how well Lignox disperses a mud system having a high calcium ion concentration — without the addition of caustic. And, of course, this dispersant performs equally well in low lime — low caustic drilling fluids and conventional lime base muds.

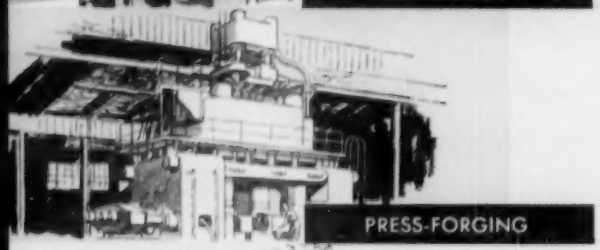
Furthermore, Lignox muds are virtually unaffected by the contaminants encountered in normal drilling, e.g.: gypsum, anhydrite, cement, salt, lime, limey shales, and clay. Lignox is a stabilizer, too, for oil-in-water emulsions . . . making it doubly useful in lime treated emulsion muds.

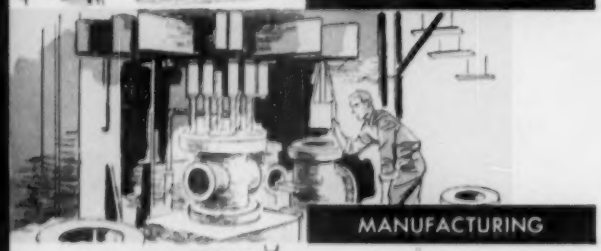
Guard against drilling failures, whenever difficult hole conditions are expected, by using muds made with Lignox.

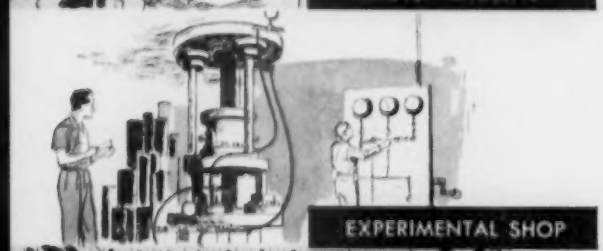
LIGNOX†
may be obtained from
BAROID DIVISION
NATIONAL LEAD COMPANY
HOUSTON, TEXAS
†Reg. T.M., National Lead Company

MARATHON *Corporation*
CHEMICAL SALES DEPARTMENT
ROTHSCHILD • WISCONSIN









MEN AND METHODS NEED THE BEST EQUIPMENT FOR THE BEST RESULTS

Cameron has **gone all the way** to make every product bearing the Cameron name outstanding. Designed to do a specific job better; engineered for all-around safety and economy; and quality controlled by completely integrated manufacturing facilities, Cameron equipment is sure to bring out the best in your men and methods.

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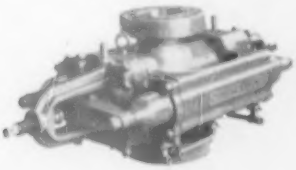
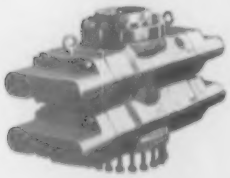


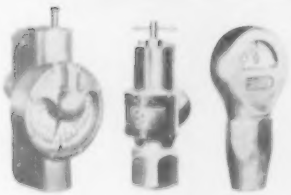
QRC PRESSURE OPERATED
BLOWOUT PREVENTERS



SS PRESSURE OPERATED
BLOWOUT PREVENTERS

HCR PRESSURE OPERATED
FLOWLINE GATE VALVES

FLEX-SEAL MUD VALVES



WEIGHT INDICATORS

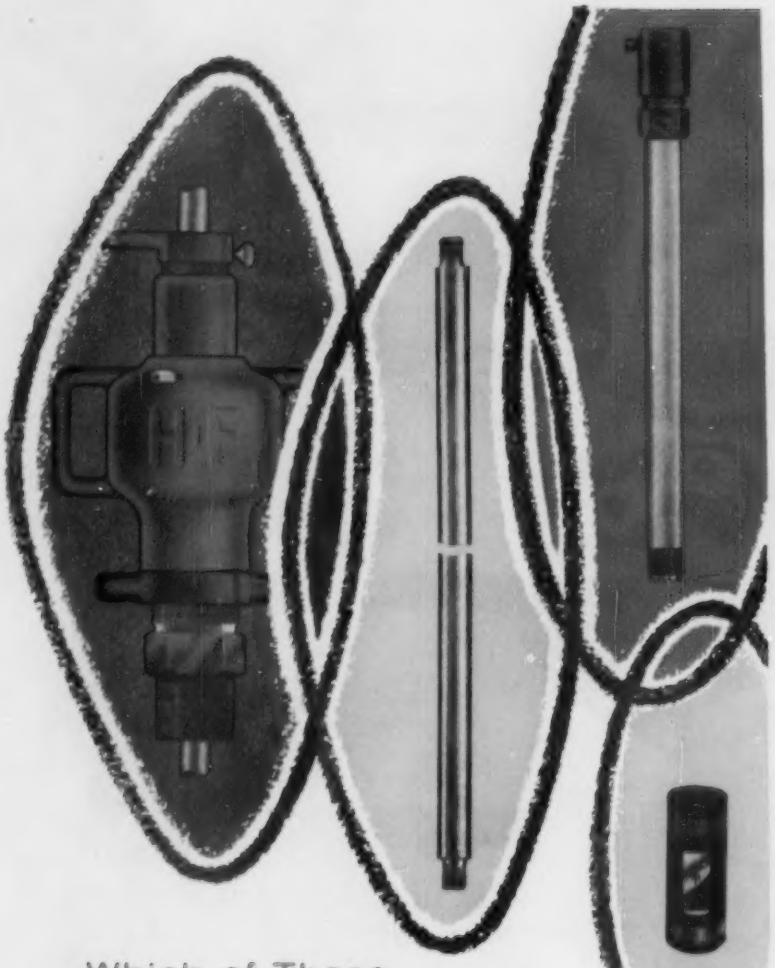
SHEAR RELIEF VALVES

MUD LINE PRESSURE GAUGES

COMPLETE WELL HEAD
EQUIPMENT AND VALVES

PRODUCTION CHOKES

SAFETY XMAS TREES



Which of These Harbison-Fischer Accessory Items Will Lower Your Pumping Costs?

The H-F Jumbo Oil Bath Polished Rod Stuffing Box? It has an extra large lubrication reservoir to keep the polished rod from running dry and wearing out the packing elements, and two full sets of packing rubbers above and below the oil chamber which provides an extra safety factor for wells that build up unusual pressures. The unit is strong and rugged — built to last the life of the well — and includes many extra features, such as changing packing rubbers under pressure. **H-F Polished Rods** are available in a full range of A.P.I. sizes from 8- to 22-ft. lengths in bronze, common steel, Pistonsteel, stainless steel, or Monel. Each rod is made of finest-quality stock and ground and polished to a perfect working surface. On the other hand you can save the cost of a new rod with an **H-F Liner and Packing Clamp** which fits over a worn-out rod. The high-grade seamless bronze liner tube will not rust, it works smoothly through the stuffing box, and is reversible for double life. **H-F Stellite Banded Sucker Rod Couplings** are especially recommended to reduce rod failures at the joints, due to excessive wear in slanted or crooked holes or from fast pumping. The coupling is banded with heavy inserts of Haynes Stellite at either end to withstand the severest wear and abrasion possible.

All of these — and many more — items are conveniently available through your store. Your store can also give you full particulars on other H-F products for pumping wells . . . or ask one of our representatives or write to us in Fort Worth. There's no obligation, of course.

● "Best Pumps in the Oil Patch"

HARBISON-FISCHER MFG. CO.

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H·F OIL WELL PUMPS

It will house the sales and service facilities of the De Laval Turbine Pacific Co., a wholly owned subsidiary of the De Laval Steam Turbine Co. The De Laval Separator Co., with home offices in Poughkeepsie, N. Y., will share these quarters to facilitate their Pacific Coast sales and service operations.

Baash-Ross Names Cypher West Coast Sales Manager

LEO CYPHER

The promotion of Leo Cypher to West Coast area sales manager, with headquarters in Los Angeles, has been announced by Hal Messinger, general sales manager for the Baash-Ross Tool Co., a division of Joy Manufacturing Co.

Cypher has spent practically his entire adult life in the oil business. He served as both a cable tool and rotary driller, has traveled to Europe, Mexico, and South America in the interests of oil, and since 1937 has been with Baash-Ross as serviceman and sales representative.

Failing Picks Lowe Runkle As Agency

George E. Failing Co., Enid, Okla., manufacturers of portable drilling rigs, has named Lowe Runkle Co., Advertising, Oklahoma City, as its advertising agency. Announcement of the Runkle Co. appointment was made by H. J. Godschalk, advertising manager of the company.

George E. Failing Co. is a subsidiary of Westinghouse Air Brake Co., Pittsburgh.

Appointment of Runkle is effective with all advertising placed after May 15. Roger Pishny, vice president, and Oscar Heuser, account executive, will handle the account for Runkle Co.

King Names Drexel as Canadian Distributor

Drexel Canadian Equipment, Ltd., of Edmonton, Alberta, has been appointed distributor of King Oil Tool products, it has been announced by W. E. King, senior partner of King Oil Tools. The King company's headquarters are located in Houston.

Jerrold Drexel, president of the Canadian firm, has had wide experience with oil-field equipment, including service with Waukesha Sales & Service and Well Equipment Manufacturing Corp., both of Houston.

Prior to this work, Drexel was as-

sociated with drilling contractors in the field. He has operated the drilling and servicing equipment firm which he heads for more than 3 years.

King Oil Tools manufactures a line of swivels, wire-line strippers, and circulating heads. A complete stock of these tools and parts is carried by Drexel for immediate delivery.

Baroid Expands Service Organization in West Texas

To meet the increasing need for trained, experienced, mud-engineering service, Baroid Division, National Lead Co., has expanded its service in West Texas and Permian basin area. Baroid's present office in Midland has been made operational headquarters for

S. D. WIGINTON

JOE W. BEANE

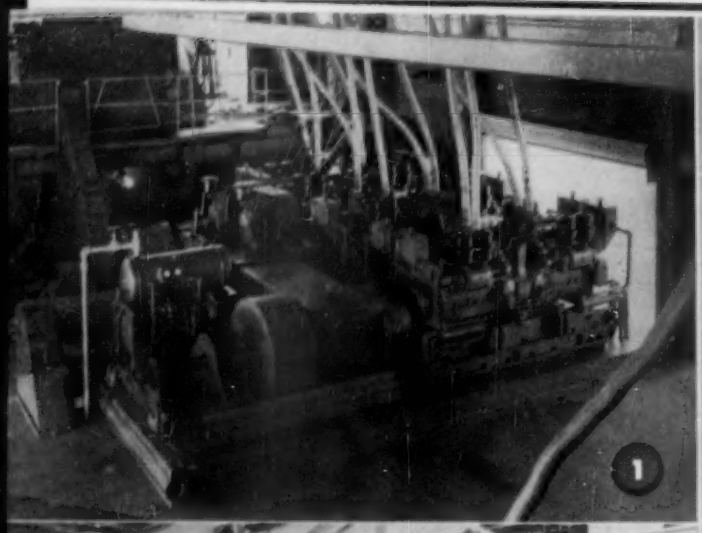
the West Texas area. S. D. Wiginton, Jr., has been appointed manager. Joe W. Beane has been appointed assistant manager, and D. D. Varnell, sales representative for the West Texas area. Homer C. Leland has been appointed area engineer. Baroid's West Texas area is made up of four operational districts.

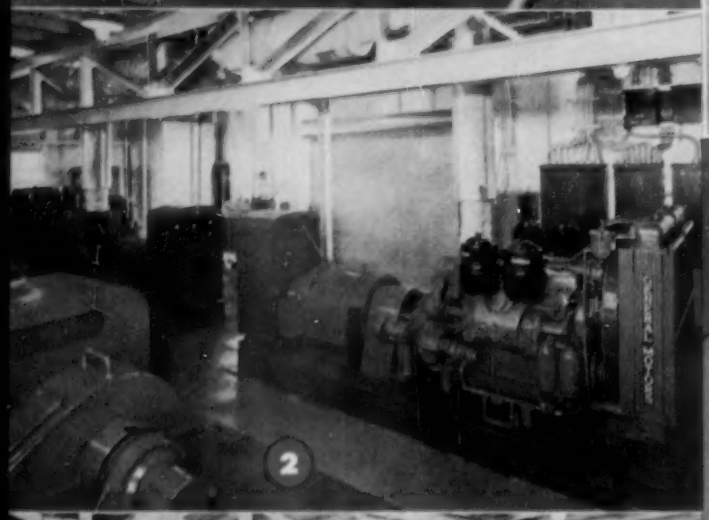
C. W. Giles has been appointed superintendent with headquarters at Hobbs, N. M.; W. A. Henslee has been appointed superintendent with headquarters at Odessa, Tex.; H. J. Blythe has been appointed superintendent with headquarters at Amarillo, Tex.; J. T. Blaney has been appointed sales representative with headquarters at Abilene, Tex., and Charles D. Allen has been appointed superintendent with headquarters at Sherman, Tex.

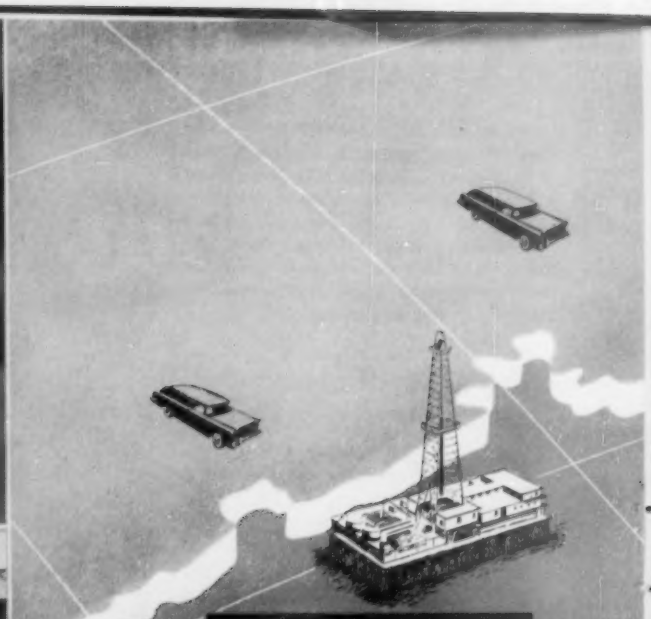
Wiginton has over 13 years' experience with Baroid and drilling-mud problems, 9 of which have been in West Texas. Prior to his appointment as manager of the West Texas area, Wiginton was superintendent of Baroid's Midland district. Beane also has been with Baroid over 13 years and was superintendent of Baroid's Abilene district prior to his present appointment.

Varnell has been with Baroid more than 17 years. Most of his time was spent in the Rocky Mountain and West Texas areas. Varnell's many years of mud-engineering experience are available to all oil operators. Leland has been with Baroid for 7 years with over

More than a mere pipe fitting!
catawissa
PERFECT SEAL
unions
give a 3 to 1
safety factor
PLUS
A PERFECT SEAL!
THERE'S A CATAWISSA PERFECT SEAL UNION FOR EVERY USE . . . ALL TEMPERATURES, ALL PRESSURES!
The full dependability of HOT FORGED STEEL is yours in a Catawissa Union (hot forged from solid steel bars) with several extra value features that are exclusive here at the UNION SPECIALISTS!
All Catawissa Unions are designed to give a 3-to-1 SAFETY FACTOR . . . 3,000-lb. service unions are tested to 9,000-lbs., 6,000-lb. service unions tested to 18,000-lbs., etc.
Exclusive Ball-to-Angle seat design assures a PERFECT SEAL even when the pipe is not in alignment!
Machining operations assure a UNIFORMITY AND ACCURACY heretofore found only in special fittings and, with rigid inspection both during and after machining, guarantees LEAKPROOF CONSTRUCTION!
Satisfaction is guaranteed in any application—whether it be general low pressure service or extremely high pressures and temperatures (for air, oil, gas, chemicals, hot oils, gases or steam).
WRITE FOR CATALOG 11
AVAILABLE FROM LEADING INDUSTRIAL SUPPLY FIRMS
CATAWISSA VALVE & FITTINGS COMPANY
450 MILL ST. ★ CATAWISSA, PA.





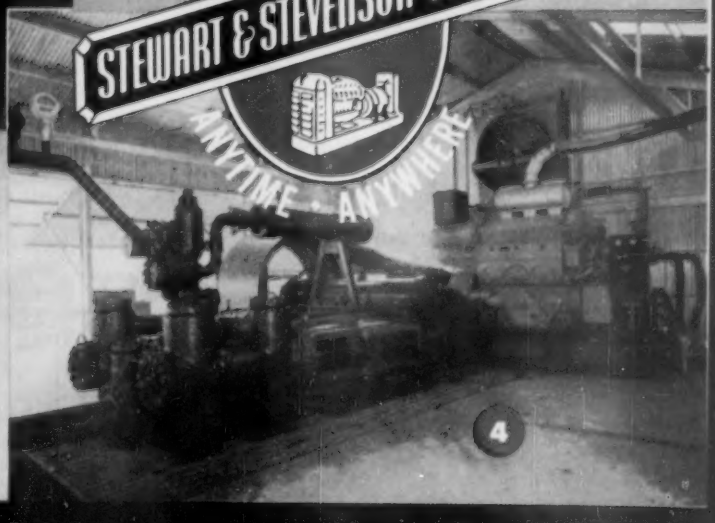


out in the gulf

PARTS • SERVICE

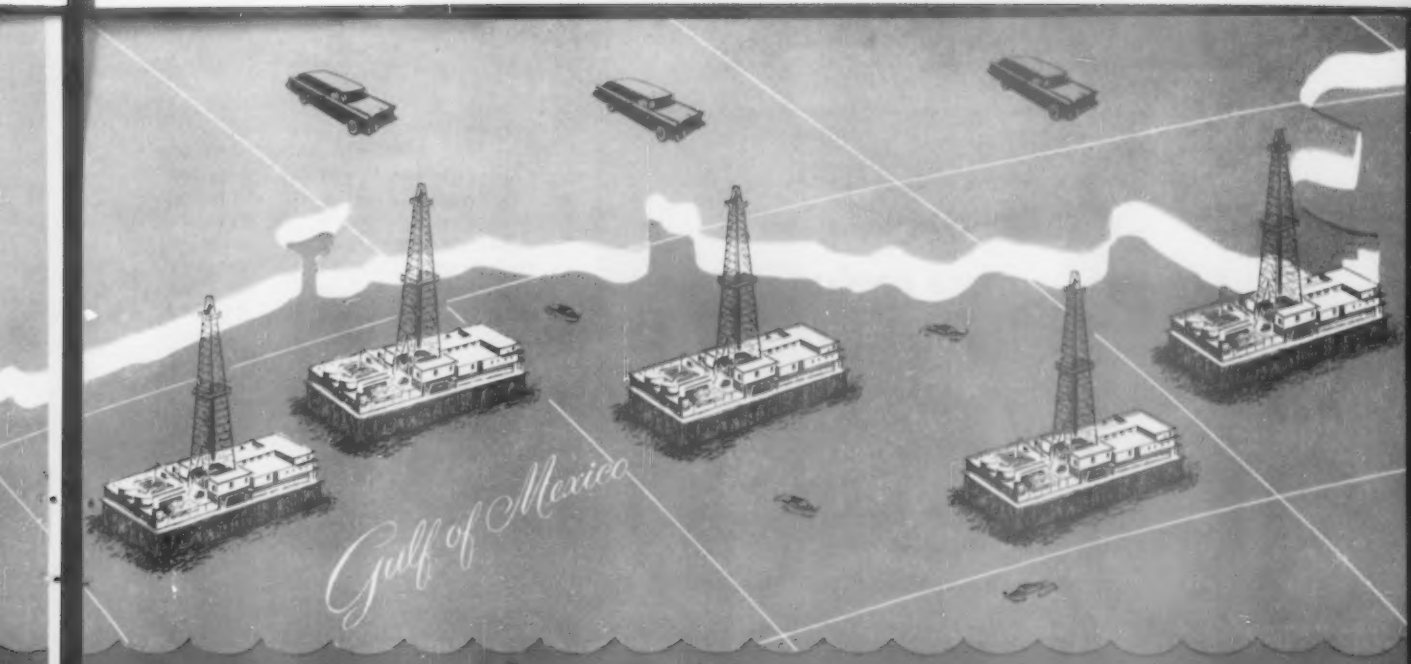
STEWART & STEVENSON SERVICES

ANYTIME • ANYWHERE



1. These three GM quad engines with a rated continuous horsepower of 520 each power a Southeastern Drilling Co. barge. A GM Diesel twin 260 continuous horsepower engine powers the 7¼" x 14" mud mixing pump on the rig and the two light plants are each powered by a single GM Diesel 6.71 engine.
2. Electricity on the "Mr. Gus" is supplied by four Model 12-GD160 Stewart & Stevenson Diesel Generator Sets.
3. The draworks and compound on the "Mr. Gus" are powered with four Model 24103 General Motors Diesel Quad Units from Stewart & Stevenson.
4. Here is a typical mud pump application using the 625 continuous horsepower Model 567-C General Motors Diesel Engine to drive an Oil Well 20 P mud pump.

*Glassock Drilling Co.



WHERE SERVICE and DEPENDABILITY REALLY COUNT

GM DIESEL BY STEWART & STEVENSON

IS FIRST CHOICE

From the start of the extensive offshore drilling program back in 1947 right up to the recent dedication of the "Mr. Gus,"* more offshore drilling rigs operating along the Gulf Coast are powered with General Motors Diesel Engines by Stewart & Stevenson than any other make.

Today when you seriously consider all of the factors, there are more reasons for selecting power from Stewart & Stevenson than ever before.

Here are a few important reasons:

1. New and Wider Choice of Power Selection. With the addition of the larger Series 567C line of Diesel and dual fuel engines, Stewart & Stevenson offers a complete range of drilling engines up to 1750 HP each.

2. Diesel Electric Drive. The new 567C Diesel electric drive units available from Stewart & Stevenson offer the acknowledged superiority, flexibility and dependability of Diesel electric drive at low initial costs.

3. Engineered Installation. Stewart & Stevenson engineers recommend the best engine for the purpose. Our factory is available for the design and fabrication of the substructure, drives, and other necessary auxiliaries and our factory-trained engineers make sure the engines are properly installed.

4. Guaranteed Performance. Stewart & Stevenson engineers and factory-trained servicemen are on the location making sure that the installation is complete and the engines operating at top efficiency.

5. Parts and Service Responsibility. A factor of utmost importance in making GM Diesels first in offshore power is the attitude of Stewart & Stevenson in assuming full parts and service responsibilities. We believe in the statement that "engines are no better than the parts and service organization behind them" and actions are guided accordingly. When you deal with Stewart & Stevenson you can be sure that if and when service problems should develop, Stewart & Stevenson will assume the full responsibility for their correction and will provide the materials, services and experience to correct them.

STEWART & STEVENSON SERVICES, INC.

CHRYSLER GM climax

Main Office and Plant:—— 4516 Harrisburg Blvd., Houston 11, Texas. Phone WOodcrest 9691.
Branches:—— Corpus Christi, Dallas, Lubbock, Wichita Falls, San Juan, Odessa.
Representatives:—— San Antonio, Longview, Brownsville.
Distributors of:—— General Motors Diesel Engines, Climax Blue Streak Engines, Chrysler Industrial and Marine Engines, Petter Diesel Engines.
Fabricators of:—— Electric Power Units, Electrical Control Equipment, Portable Pumping Units, Red Head Pumps.

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STEWART & STEVENSON SERVICES
ANYTIME • ANYWHERE

THE NATION'S LARGEST DISTRIBUTOR OF GM DIESEL ENGINES

more profitable pumping from SANDY WELLS

You'll have more production time . . . less maintenance time with a D+B 3-Tube Pump on your sandy well.

The three telescoping tubes are loose-fitting and free-falling to handle excessively abrasive fluids. The D+B 3-Tube Pump also operates efficiently at high bottom hole temperatures.

The loose-fitting, precision ground plunger prevents sticking and sets up a turbulence that keeps the sand in suspension. An optional bottom discharge valve assembly aids in scavenging sand from the annular space between tubing and pump. The middle or standing tube is induction-hardened to provide longer life and eliminate galling.

D+B 3-Tube Pumps are available in both positive-pull and removable-key types in lengths of 12′, 15′, 18′ and 25′. Call your nearest CONTINENTAL or D+B store for details on sub-surface pumps and parts.

CONTINENTAL
Serving the Oil and Gas Industries

THE CONTINENTAL SUPPLY COMPANY
General Offices: Dallas, Texas
Representatives in all principal oil fields of the world

D+B
• DEEP WELL PUMPS
• SUCKER RODS
• COUPLINGS

D+B DIVISION
EMSCO MANUFACTURING COMPANY
Garland, Texas
LOS ANGELES, CALIF.
Houston, Texas
General Sales Offices: Dallas, Texas

E-194-55

5 years experience with mud programming in the West Texas oil fields.

Giles has had 11 years of experience with Baroid and will be responsible for the activities of the service engineers in extreme West Texas and Southwest New Mexico. Henslee has had 9 years of drilling-mud experience with Baroid and will supervise activities of the service engineers in the balance of West Texas. Blythe has been with Baroid for 13 years and is responsible for the activities of service engineers in West Central Texas and the Texas-Oklahoma Panhandle. Blaney has been with Baroid for over 9 years, and Allen has had 10 years experience and will supervise the service engineers activities in North Texas.

Marlow Pump Promotes North to Executive Post

J. L. NORTH

The appointment of John L. North as manager of national accounts of the Marlow Pump Division of Bell & Gossett Co., has been announced by A. F. Woods, sales manager. North has been associated with the sales department at Marlow for over 2 years. He will now take full responsibility for those accounts which are not limited to any one territory, but operate across the country.

Foster Named to Executive Post by Wyatt Metal

E. F. FOSTER

E. F. Foster has been appointed manager of purchases of Wyatt Metal & Boiler Works, with headquarters in its Houston offices.

He had been with Wyatt's since 1945 when he went to work in the Houston plant. Later he was transferred to the purchasing department where he was assistant to J. S. Gowdy, who has resigned.

Prior to that he was in the construction department of United Gas Corp. and its subsidiaries for 17 years.

Darwin Clark Appointed Hillman-Kelly's Agency

Hillman-Kelley, oil-tool manufacturer with headquarters in Los Angeles, has appointed Darwin H. Clark Co.,

for lower cost control of moderately **Corrosive** fluids

Fig. 2651-A Gate

JENKINS

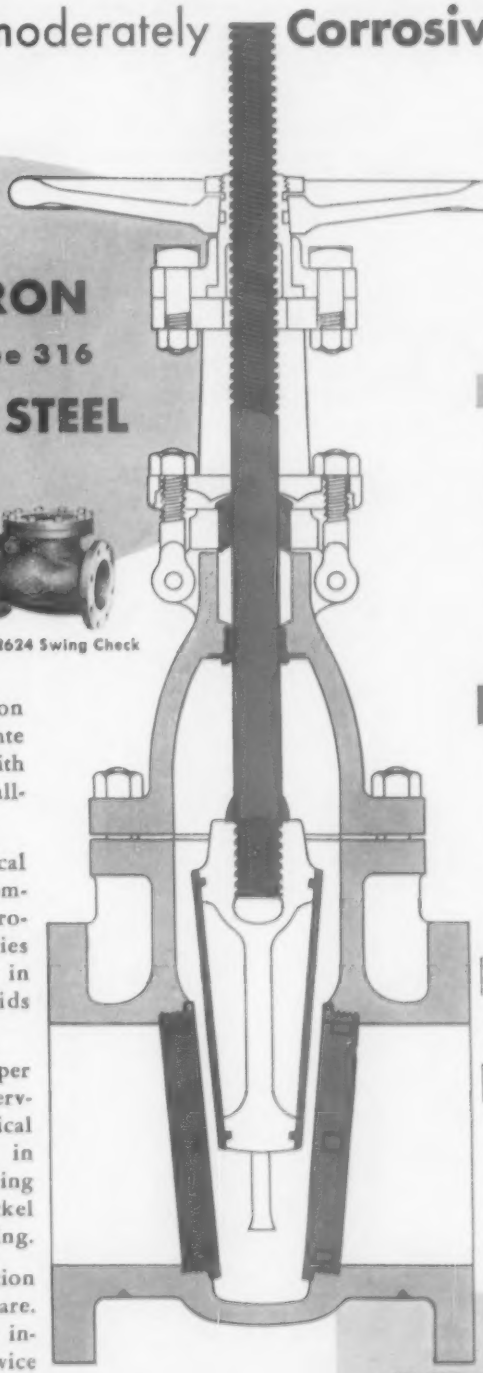
NICKEL IRON

Valves with Type 316

STAINLESS STEEL

Trim

Fig. 2624 Swing Check



This combination provides corrosion resistance well above the moderate need in many processing services with an investment well below that for all-stainless steel valves.

Designed primarily for the chemical process industries, they are recommended for control of mildly corrosive liquids with minimum quantities of mineral acids, such as creosote in wood treatment, and many liquids carried in petroleum processing.

A major use is in pulp and paper processing, particularly in lines serving the digester, and in the chemical recovery cycle. Service records in lines carrying the valve-punishing "black liquor" give Jenkins Nickel Iron Valves top performance rating.

Jenkins *extra value* construction throughout. Get details — compare. See why they stretch your valve investment dollar — with longer service life, lower maintenance cost.

Every part in contact with fluid is the right metal to block corrosion and beat wear.

Cast NICKEL IRON

- **BODIES** Heavy duty, dimensioned for greater resistance to wear and abuse. Through port design in Gate Valves.
- **BONNET** Rugged construction, like body. Swing-type gland bolts. Screwed-in back-seating bushing. Deep stuffing box.
- **YOKE** Integral with bonnet in 2" to 4" sizes.
- **WEDGE** In 10" to 24" sizes, with Stainless Steel Wedge Rings.
- **COVER** In Check Valve.

Type 316 STAINLESS STEEL

- SPINDLE
- GLAND
- BONNET BUSHING
- SPINDLE RING
- WEDGE PIN
- WEDGE RINGS Rolled into Nickel Iron Wedge in 10" to 24" sizes.
- SEAT RINGS
- DISC and HANGER in Check Valve

NI-RESIST Type No. 2

- WEDGE of I-beam structure is solid NI-RESIST in 2" to 8" sizes.

PRESSURE RATINGS

2" to 12"—200 lbs. O.W.G.
14" to 24"—150 lbs. O.W.G.

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American-Westcott Series A-88 standard mercury type orifice meters for working pressures to 5000 psi in interchangeable 10, 20, 50, 100 and 200-inch ranges give you complete versatility to meet any flow measurement requirements.

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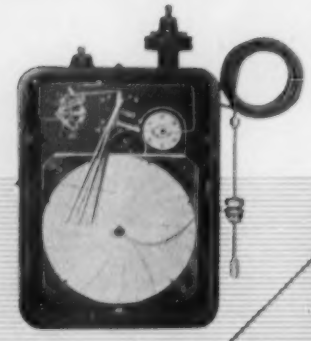
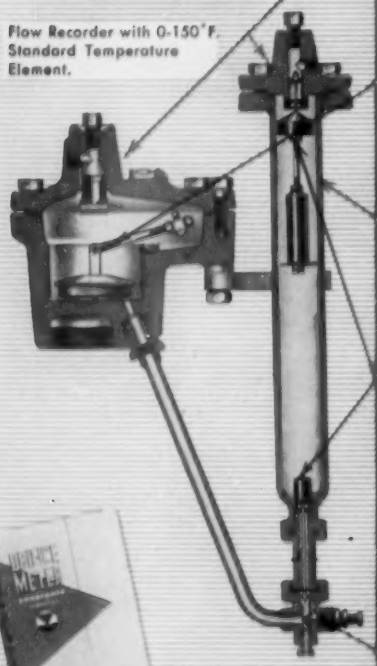


Flow Recorder with 0-150° F. Standard Temperature Element.



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EXTENDED HIGH SIDE chamber gives additional over-range protection — interchangeable without altering manifold piping.

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Hillman-Kelley products include pneumatic and hydraulic-power tubing tongs, pneumatic and hydraulic-power sucker-rod wrenches, hydraulic-power units, and air compressors. Branches are maintained throughout the Gulf Coast and Mid-Continent areas.

Vandenberg in South America For Fluid Packed Pump

Don Vandenberg, sales manager of Fluid Packed Pump Co., is making an extended trip through South America in the interest of Oilmaster pump specialties. Vandenberg will meet with his company's exporting distributors, The National Supply Co. of Venezuela, confer with its personnel, and visit oil fields and field stores.

While in South America, Vandenberg will also visit Panama and Colombia. On his return trip he will visit National Supply export division in New York City and the National Supply Co. in Pittsburgh.

B-I-F to Expand Sales, Service in Midwest Area

B-I-F Industries, Inc., Providence, R. I., has announced greater sales and service facilities for customers in the Chicago district.

This new expansion program, highlighted by the formation of two new B-I-F offices, takes form in the addition of factory-trained personnel skilled in the products manufactured by Builders-Providence, Inc., Proportioneers, Inc., and Omega Machine Co., Divisions of B-I-F Industries.

M. H. Strickland has been appointed manager of industrial sales for the Chicago district which will now handle the complete industrial line of equipment for Proportioneers, Inc., manufacturers of chemical feeders and automatic blenders.

A new office in Milwaukee, Wis., is headed by Harold D. Bugg while another new office in Indianapolis, Ind., is managed by Byron Anderson.

In Minneapolis Thomas Voegtli has been added to the sales-service department. Harry McBride, with B-I-F for 6 years, has joined the Kansas City sales force with M. Stuart Caton now in the K. C. service department.

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Here's a picture of a situation that happens every day. A telephone call from a user of O-C-T Equipment . . . and the O-C-T Service Organization gets in high gear.

As a result of its continuous expansion program during the past six years, Oil Center Tool Company now has the largest service organization in the field to help you set and service wellhead assemblies.

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25% INCREASE IN PENETRATION RATE WITH DRISCOSE*!

Figures for 10 Texas wells, where characteristics of mud systems were practically identical with respect to viscosities and weights, show that the use of **DRISCOSE** in a mud with a low concentration of solids helped to increase rate of penetration approximately 25%. Water loss was lower, too . . . 6 to 8 cc with **DRISCOSE** as compared to 10 or 12 cc where **DRISCOSE** was not used. And in addition, wells that mudded up at 10,000 feet with **DRISCOSE** continued to drill just as fast as when they were using clear water . . . no slow-up of penetration due to mudding with **DRISCOSE!** Write for complete information.

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EXPLORATION

Pacific Northwest Tempts Wildcatters

by Frank J. Gardner

DRILLERS have buried 275 dead wildcats in the State of Washington, and nearly a hundred in Oregon. But this dry-hole graveyard continues to attract new tests. Every few years, the word flashes that one of them has found a good showing of oil or gas, and a great revival takes place. The last really good one was in 1951. Another one is on now.

Two influences at work . . . This time, no showing or rumor or tangible reward is responsible. Two new factors influence the play. First, a growing number of big oil names is popping up on lease records in the two states; the doors of new land and geological offices are emblazoned with these same names. This trend is believed to be the result of a rather extensive seismic and surface umbrella that has spread over the Pacific Northwest recently.

The second factor is that the Pacific Northwest Pipeline is rolling at last—and the ready market it dangles is a tempting carrot for the gas-minded wildcatter in the Northwest. Then too, the new refineries north of Seattle will be turning out some 85,000 bbl. of petroleum products daily by late 1955. But now they depend upon crude piped 800 miles from Canadian fields or brought in by tanker from California and foreign fields. So an oil field at Seattle's back door would indeed be a prize asset.

At the moment, only a few drilling operations are active. But the amount of geological and geophysical work now in progress points to a spirited campaign in the near future.

In Washington . . . Union Oil Co., Continental Oil Co., and Standard of California have actively probed western Washington. As early as 1947, Standard sank the state's deepest well to 11,002 ft. (D on map). But except for noncommercial showings in the Grays Harbor area (C on map) and small methane wells at Bellingham and Rattlesnake Hills, Washington has been remarkably unresponsive.

Today, Kris Petroleums is exploring to 6,000-7,000 ft. in the northern Bellingham basin (E on map) on its 65,000-acre block astride the international border. This operator's first test, the 1 Whatcom, in 1-40n-2e, is at the 5,000-ft. level now, and may go to 7,000 ft. before the second test is begun on the British Columbia side.

Grays Harbor and Pacific counties in southwestern Washington have attracted more wildcatting than any other part of the state. It was here that two interesting wells, Union 3 State (1950) and Hawksworth 4 State (1951) found noncommercial production of oil from Miocene sands at intervals between 3,586 and 4,876 ft. And it was here that Continental recently sank nine shallow (2,000-4,000 ft.) wells. Discouraging results halted the Continental program, and the company is said to have dropped some of its acreage there. But it is taking a close look at other Washington prospects.

And in Oregon . . . Western Oregon has more to report: two deep wildcats on its western coast are on the way down. The most recently announced of these, Sinclair Oil & Gas Co. 1 Mapleton-Federal (A on map), will go to more than 9,000 ft. It is located in Lane County (12-16s-10w). The company holds one of the largest lease blocks ever assembled in western Oregon—350,000 acres in Lincoln, Benton, Polk, Douglas, and Lane counties. For full evaluation, several tests will be required. In the vicinity of Mapleton, site of this first test, Sinclair has an almost solid block of about 50,000 acres.

At B on the map, Standard of California is below 4,000 ft. at its 1 Hoagland Unit in Clatsop County. This is a tight hole and contract depth is indefinite, but the rig is capable to 12,000 ft. or more. Standard is the largest leaseholder in Oregon, as well as in Washington.

Eastern Oregon stole the spotlight in mid-May when Oroco Oil & Gas Co. 1 Johnson, a wildcat across Snake River in Idaho, blew several stands of pipe from the hole after starting to unload at 4,032 ft. This well, and Oroco's 1 Carpenter (also in Idaho), have both indicated gas production, and both are being worked over for completion at the present time. Oroco's 1 Bolles, across Snake River in Oregon, is being abandoned. These three wells are indicated by G on the map. At H, R. N. Ranger et al are drilling a 6,500-ft. test on Malheur County's Willow Creek structure. This, the 1 Eastern Oregon Land Co. (15-16s-44e), is on a farmout from Sinclair, who holds 100,000 acres in the Vale-Ontario basin area.

Another active Oregon test is at F on the map. This is Northwest Oils, Inc. 1 Morrow Brothers, a wildcat spudded in 1952, suspended in October 1953 at 2,672 ft., and now going deeper.

May change the picture . . . Geologists in the past have taken a dim view of the oil possibilities in the Pacific Northwest. But the same was true for Nevada a couple of years ago. The geological conditions are not dissimilar, and the oil seeps on the Washington coast, the showings at Grays Harbor, and the gas blows at Snake River are production clues not to be overlooked. The picture may easily change.

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3

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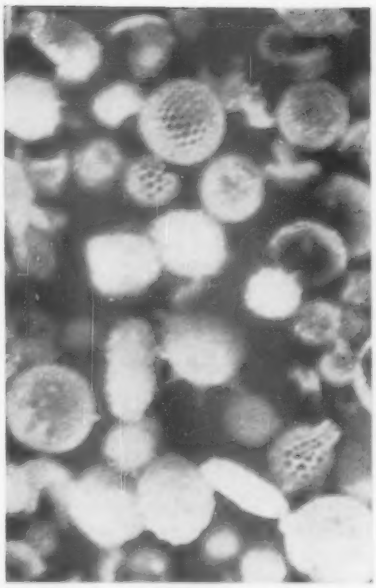

RADIOLARIA have siliceous skeletons of highly intricate design. They are found in large quantities in some marine deposits.

FOSSIL MARINE DIATOMS like these are thought to make up the major source material of petroleum.

PRESENT-DAY PROTOZOA like these species are similar to those which were responsible for ancient sediments.

A biochemist explains . . .

How Microbes Affect the Formation of Oil

by Dr. Ernest Beerstecher

IN 1804 Humboldt made the first concrete suggestion as to the origin of petroleum. He believed petroleum to be the distillate from deep volcanic strata. Many theories have been advanced since then. In the past decade, sound experimental evidence has been gathered to validate our concepts of petroleum formation Much of this evidence is concerned with the role played by microscopic organisms in petrolem formation, both as source materials and as agents in the conversion process from sedimentary matter to crude oil.

Microbes . . . Most of the great changes that have been made in surface geology by living things were brought about by the single-celled microbes.

There are three general types of microbes: animal, photosynthetic plant, and nonphotosynthetic plant. Examples of these general types are:

. . . Foraminifera. The skeletons of this group are found in only certain geologic eras, and thus can be used for dating geologic strata in which their shells are found.

. . . Radiolaria. These are found in great abundance in some ancient marine deposits. They make up a great portion of the oozes that cover parts of the ocean floor.

. . . Diatoms. The world's large deposits of diatomaceous earth consists largely of the silicate skeletons of ancient marine photosynthetic single-celled plants. It is probable that living organisms of this general type make up the major source material of petroleum.

. . . Bacteria and molds. The nonphotosynthetic plant type of microbes is less well known in fossil form, but it does exist.

How microbes form and accumulate oil . . . Our principal interest here is in how the microbes are thought to function in the formation and accumulation of the vast petroleum reservoirs of the world. There are many theories. The earliest ones were based upon the assumption that the hydrocarbons of petroleum had an inorganic origin. This concept soon was proved untenable. It followed that petroleum must inevitably have been formed from preexisting organic material. Since organic matter is only formed as the result of living processes, it rapidly became apparent that some form of life was the original source material. The next great problem that arose was the mechanism by which organic matter from living cells is converted into petroleum.

Many felt that the responsible forces

THE AUTHOR

Dr. Ernest Beerstecher is associate professor of biochemistry at the University of Texas in Houston. He is a graduate of Wayne University and the University of Texas. Internationally known for his research in microbiology and biochemistry, the author has written over 50 research publications. Dr. Beerstecher is the coauthor of a widely used textbook of biochemistry and of the American Chemical Society technical monograph on the biochemistry of the B vitamins. For many years he has devoted special attention to biological aspects of the petroleum industry, and he has served as a consultant to the industry in petroleum microbiology.

Venture, General Offices, Manufacturing and Export Division, Houston, Texas.
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in petroleum formation were purely physical in nature—heat, pressure, inorganic catalysis, radioactivity, or a combination of these. Others felt that biological forces were involved. It also seemed possible that methane gas, which some bacteria produce, might be condensed under high temperatures and pressures to form oil. Another theory was that hydrogen, which other bacteria produce, might catalytically reduce other more complex compounds to form petroleum.

The geological fence . . . In order to consider the problem of petroleum formation more specifically, it is well to consider the guide laid down by B. B. Cox under the heading, the *Geological Fence*. Five corner posts in this fence were defined as representing facts which are sufficiently well-established to be acceptable as a starting point for further investigations.

1. Organic origin. Petroleum is always associated with sediments containing a relatively large amount of organic matter. Petroleum also contains complex organic substances of an obviously biological origin. Petroleum is absent from all formations having an adequate trap and porous reservoir but no organic source.

2. Marine environment. This is assured by the invariable association of marine sediments with petroleum.

3. Temperature. Petroleum must have been formed at relatively low temperatures, probably below 100° C, because of the presence in it of substances readily destroyed at higher temperatures.

4. Pressure. Formation of oil was probably limited to certain pressure ranges. But this has little bearing on the role of bacteria in the process because many of these can withstand pressures exceeding 5 tons per sq. in.

5. Time. There was apparently no formation of petroleum prior to Cambrian time, and little or none since Pliocene time.

The major components of source sediments . . . Essentially, all of the world's oil fields are associated with marine sediments. It appears that the best oil-yielding sediments were deposited in shallow waters. There are sound biological reasons for this.

In deeper water, the time required for particulate matter to reach the bottom may be quite long. So the vast numbers of marine bacteria which live in the sea have ample opportunity to destroy essentially all of the organic matter, leaving little or none to be converted to hydrocarbons in the sediments. Oxygen is essential to this destruction, but an ample amount of it is dissolved in most sea water to permit this bacterial action. There is little or no oxygen in the bottom deposits of both shallow and deeper waters, so that organic sedimentary matter is safe from oxidative destruction once it hits bottom.

Thus, the role of bacteria in the settling of sediments is one that tends to oppose the accumulation of organic sediments. This tendency is proportional to the depth of the water.

Lipids or fats are resistant to bacterial attack, and thus stand a good chance to reach the bottom layers. These fatty substances outnumber other types of organic material in the bottom muds and represent the greatest potential raw material for conversion to petroleum.

2. A second reason why shallow marine areas present the most favorable sedimentary basins is that sunlight may be able to penetrate the entire depth of the water. This causes greater growth of microscopic plants per unit volume of water. Thus a greater proportion of organic matter reaches the protective bottom layers and so escapes destruction.

3. A third factor favoring shallow waters concerns the mineral nutrition of the microscopic plant life of the sea. The natural growth rate of the microorganisms may be severely limited by exhaustion from the water of various mineral salts necessary for their growth.

High nutrient salt concentrations normally accumulate near the bottom. In shallow areas, these may be brought to the surface by seasonal changes. In coastal areas, there is an upwelling of currents which tends to bring minerals to the surface constantly, thus promoting a more dense growth of plant life.

Slow runoff from land areas further aids in renewing the supply of nutritional materials. Sudden heavy rains, however, may reduce the total salt concentration of shallow waters appreciably and cause bursting and sudden death to most of the microscopic plants. This would create a prodigious mass of sedimenting material which may reach the bottom layers successfully.

It has been observed that geologic strata containing broken-up or burst diatom fossils are generally better petroleum producers than those strata in which the fossils are intact.

4. To further favor shallow areas, waters entering them from the land may introduce a further heavy load of suspended organic matter. And suspensoid clays in these fresh waters may aid in promoting flocculation and sedimentation of dissolved organic matter.

Beyond any doubt, larger plants and animals also constitute a portion of the marine sediments. These, however, are a relatively small part of the total mass of life in the sea, even smaller in past petroleum-producing geologic areas.

Recent Sedimentation

In some West Coast oil fields, diatoms and foraminifera were almost exclusively the source materials of the petroleum. In these same areas, all of the factors mentioned may readily be observed in operation in the formation of recent sediments containing vast amounts of these species.

Emery has recently estimated that the present rate of sedimentation in the Los Angeles Basin, when applied to times past, would suggest that about 8.5 billion barrels of oil would be available there from the Pleistocene and Pliocene. This figure is remarkably close to the 4.9-billion-barrel past and proven future of the basin. Let's assume that sunlight is the principal energy source for the growth of the microflora in this area, and that these die, are buried, and converted to petroleum at the present rate. Then we may estimate that the sunlight capable of producing six million barrls of oil, on a theoretical basis, actually results in the formation of only a single barrel. From the standpoint of this concept, petroleum represents to the earth, in one sense, a storage form of sunlight energy more stable than the organic matter of plant life that fails to reach the protective cover of the sediments.

Hydrocarbons in recent sediments . . . For many years it was impossible to demonstrate the presence of liquid hydrocarbons in recent sediments. This handicapped all concepts of petroleum formation.

Yet it has long been recognized that bacteria exist which are able to destroy hydrocarbons at a fast rate. It was suggested some years ago that these might be destroying the hydrocarbons in recent sediments between the time when samples were taken and when they were analyzed in the laboratory.

In 1952, Smith of the Esso laboratories demonstrated that this was so. He showed that with proper precautions it was possible to demonstrate appreciable amounts of hydrocarbons in even very recent sediments. Hydrocarbons present would account for about 4.5 million barrels of petroleum in a cubic mile of sediment. That the hydrocarbons present did not arise by diffusion from underlying strata was shown by the fact that their average age, as shown by carbon-14 dating techniques, was about 14,000 years.

Source of petroleum hydrocarbons . . .

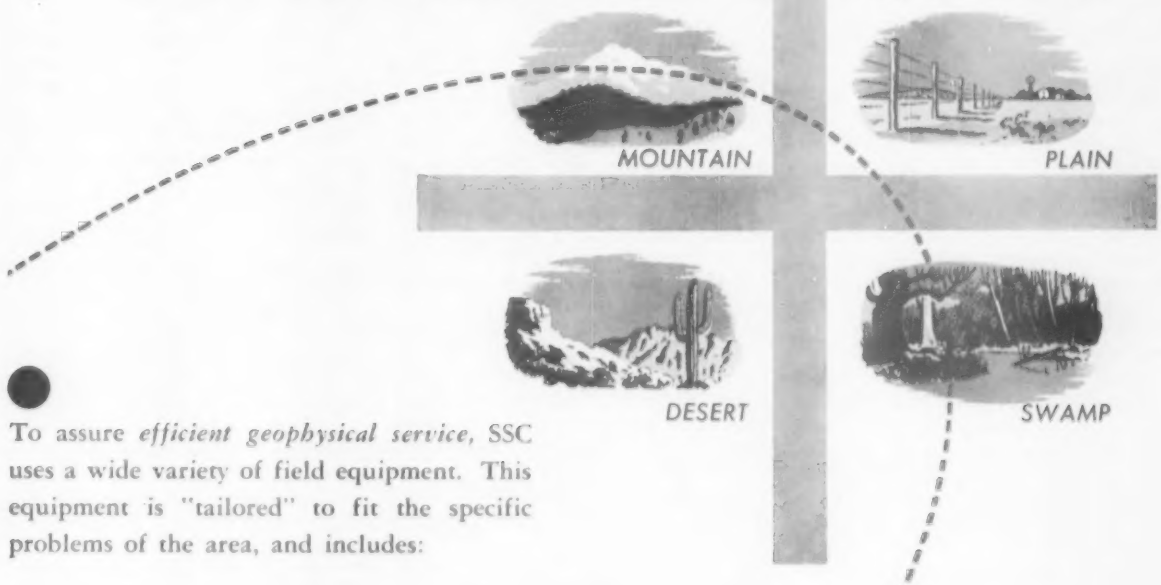
shells are found.

consultant to the industry in petroleum microbiology.

Many felt that the responsible forces

In Seismic Exploration

TYPE OF EQUIPMENT is Important



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It has always seemed that fats of marine organisms might provide the best possibility as to the source of the hydrocarbons in petroleum, since they are the best preserved of all materials during sedimentation and are present in large amounts.

There is an even more simple mechanism of oil formation that should be mentioned. All plant organisms, and many animal ones, contain small amounts of hydrocarbon materials, varying from the very lightest gaseous hydrocarbons to the heavy ones containing over thirty carbon atoms. Knebel has estimated that about 80 million barrels of hydrocarbons are produced annually by organisms in the sea, and that if only 1/10,000 of this were saved, over a 100-million-year period it would equal the expected world's resources of oil in commercial pools.

There is a great deal of difference between plant fats and hydrocarbons on one hand, and crude oil on the other. One might question whether microorganisms can exist under the deeply buried conditions in which petroleum itself is apparently formed. The fact is that the great extremes of heat and cold found deep in the seas or the earth are no deterrent to microbal action. Bacteria are found at temperatures below —10° C. and at 5-mile depths in marine muds more than 100,000 years old. Other species thrive at temperatures just below the boiling point of water.

Microorganisms may grow at pressures exceeding 10,000 atmospheres, tolerating high temperatures even better than normally. They thrive well over extreme ranges of acidity or basicity, and can live without oxygen. And very old sediments do not deter their activity.

Although it may be hard to visualize, it is entirely possible for life to exist thousands of feet below the surface in complete isolation for tens of thousands of years. Live bacteria have been found in waters from a well at 7,000 ft. in El Segundo, in oil-bearing Permian and Devonian strata of Russia, and in sulfur limestone anhydrite ⅓-mile down on the Gulf Coast. There is no question that microorganisms can survive and remain active in deeply buried petroleum-forming and petroleum-bearing formations. In fact, these may constantly be changing the nature of petroleum.

The bacterium, *Desulfovibrio desulfuricans*, can only live in the complete absence of oxygen. It derives its energy from the conversion of sulfates to sulfides. It presents an excellent explanation of the low sulfate content of oil-field waters, and may explain the high sulfide content of some.

There is some evidence to suggest that part of the food of this and other microbes may come from the formation of cyclic hydrocarbons and the polymerization of lighter ones to form long-chain hydrocarbons. From this standpoint, naphthenic petroleum would represent the end product of the changes in paraffinic petroleum by bacteria. Mixed petroleum would represent incompletely converted materials. And aliphatic petroleum is either geologically young or not available for bacterial action.

Conclusions . . . The foregoing discussion does not imply that concurrent physical mechanisms in the formation are without effect. Biological forces only help to explain the over-all picture. There can be little doubt that, by biological processes, petroleum hydrocarbons are formed in only very small concentrations, and that concurrent compaction and migration phenomena are essential for concentration of the product in the form that we recognize it. While much research remains to be done, it is already abundantly clear that biological considerations assist materially in broadening our comcepts of the geochemical mechanisms by which petroleum is formed.

THE OIL AND GAS JOURNAL

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HUGOTON EMBAYMENT

SOUTHWEST KANSAS

Revival of Activity Due In Southwestern Meade Area

Colorado Oil & Gas Co. 1-3 Leslie, SW NE 3-33s-30w, 3 miles south of Plains in Meade County, is a new Morrow oil discovery, reviving activity in a relatively quiet Hugoton area.

The well flowed an estimated 50 bbl. per hour on drill-stem test in the Morrow at 5,673-93 ft. The well swabbed 8½ bbl. of oil per hour natural on first test gage at 5,668-84 ft. This discovery is 2 miles north of Northeast Buno-Morrow gas field.

OKLAHOMA PANHANDLE

Northwest Mocane Field Gets Third Checkerboard Producer

The third Checkerboard lime oil well in new Northwest Mocane field, Beaver County, was completed at Cabot Carbon Co. 3 John C. Hodges, NE NE 1-5n-24eCM, east offset to the 2 Hodges and northeast offset to the 1 Hodges discovery.

The No. 3 well flowed 264 bbl. of oil daily on ¼-in. choke from perforations in the lime at 5,272-94 ft. The well also has commercial Kansas City lime oil production. This well and the No. 2 well both show for production in the Kansas City, opening a new pay for the Oklahoma Panhandle.

First Inside Hugoton Field Morrow Production Assured

Oceanic Oil Co., the operator that established first oil production inside Hugoton field, has been assured first Morrow sand gas production inside the limits of Guymon-Hugoton field at their 1 Burdge, SW NE 20-6n-16eCM.

The Texas County discovery, located about 8 miles northwest of the town of Hooker, is shut in after flowing 2,700 M.c.f. of gas per day on a 2-hour blowdown from the Morrow sand. Perforations were at 6,484-6,500 ft. The new strike is 1½ miles south of the Kansas State line. It is 20 miles southwest of a similar discovery inside Hugoton field in Seward County, Kansas. It is 2¾ miles north of the Swinger discovery, the first oil (Des Moines) pool inside Hugoton field.

Oceanic Oil Co. 1 Burdge is the first Morrow discovery in the Oklahoma Panhandle portion of vast Hugoton field production.

MID-CONTINENT

KANSAS

Viola Discovery Seen For Reno County Area

Reno County has a Viola discovery in prospect at Globe Oil & Refining

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Co. 1 Hornbaker, SE NE NE 29-25s-6w, 2 miles southwest of Castleton.

Recovery was 560 ft. of gassy oil on a drill-stem test at 3,983-4,002 ft. The discovery well is 4 miles northwest of North Albion field.

Barton County . . . McKnab Drilling Co. 1 Nuss, SE SE NW 5-16s-14w, swabbed 70 bbl. of oil per hour for 8 hours after acid treatment of the Lansing at 3,183-87 ft., according to reports.

This discovery is 2½ miles west of Trapp pool.

Sedgwick County . . . This county has a Mississipipan discovery at Time Petroleum Co. 1 Dugan, SW SW NE 18-28s-1w, 1 mile south of Schulte pool. The operator reported a fillup of 800 ft. of oil in 3 hours from the Mississippian chat at 3,390 ft.

Marion County . . . Chas. L. Carlock 2 Unger, SW SW NE 8-21s-3e, is a Marion County strike. Recovery of 2,700 ft. of oil was reported with a swab test of 50 bbl. of oil in 8 hours reported from the Hunton at 2,809 ft.

Lansing Discovery Indicated At Barton County Wildcat

Leben Oil Co.'s 1 Hiss, NW SW NW 17-19s-14w, is a promising Barton County discovery well, 1 mile west of Heizer pool.

Recovery on a drill-stem test in the Lansing at 3,547-51 ft. was 2,100 ft. of gas and 840 ft. free oil. It is 1 mile west of Heizer field with dry holes between.

OKLAHOMA

Simpson Show Reported at Love County Prospect

Simpson oil has been found in a Love County wildcat. It is Frankfort Oil Co. 1 Gardner, SW NE NW 34-6s-2e. Recovery on a test at 4,303-30 ft. was 60 ft. heavily oil and gas-cut mud, 10 per cent oil.

Summer Begins With State Activity Above Average

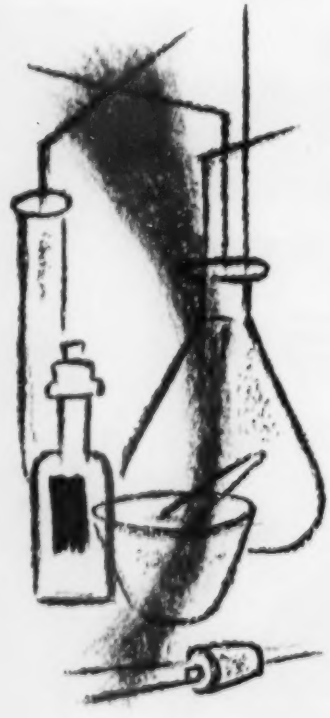
The first half of 1955 exploration and development in Oklahoma is nearing its successful end with all sections of the state enjoying near-record or above average success and activity. The outstanding sectors of the state are: North Madill, Carter County, Cleveland County, and Love County's North Marietta area.

North Madill . . . The discovery of 1954 in Oklahoma, North Madill field, is living up to its fine promise as a prolific Ordovician reservoir for southern Oklahoma's Marshall County.

It is now believed that the field will recover one million barrels plus per well on 40-acre spacing. The northwest-southeast Ordovician trend extending through 5s-5e will undoubtedly expand to find new reserves. North Madill with its nine indicated commercial pays has a very promising future. The latest extension well in the field is Sinclair Oil & Gas Co.'s 1 Taliaferro, SE SE SW 14-5s-5e. This well made 42 bbl. of flowing oil per hour on a fractured second Bromide sand interval at 6,240-6,312 ft. Gravity is 37°.

Carter County . . . This southern county's new Viola trend off the south flank of Lone Grove field, extending from Healdton to Brock, is one of the exploratory highlights of 1955.

It is expected that a development program will be active here for the next 1½ years at the least. The objective will be the Viola lime reservoir which Frankfort Oil Co. established. This trend extends from 19-4s-3w to 19-5s-1e, southeastward to 34-6s-2e in the Marietta area. Viola and Arbuckle lime production are assured and being developed in the trend. The newest new-pay strike is at Frankfort's 1



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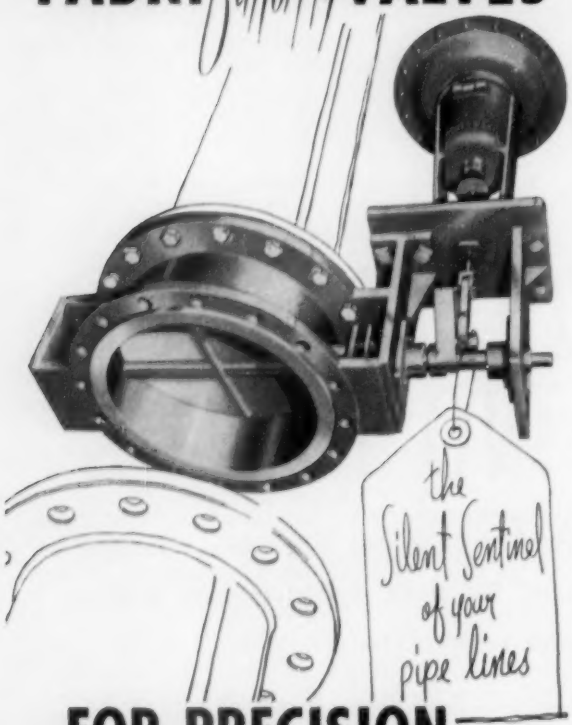

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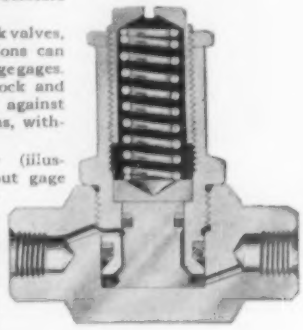

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Greenwood in NW SW NW 12-5s-2w, where lower Dornick Hills production is being evaluated. Oil flowed at the rate of 20 bbl. per hour from 5,331-62 ft. on drill-stem tests.

West Short Junction . . . This Cleveland County Hunton lime reservoir is becoming an important new reservoir for Continental Oil Co., principal operator. It is in Sections 17 and 22-10n-4w.

North Marietta . . . Frankfort Oil Co. has found good recovery on tests of Bromide sand at 3,535 ft. at their 1 Gardner, SW NE NW 34-6s-2e. The same firm recently established the southeastern leg of the Viola trend that comes down from the northwest from Lone Grove.

NORTH TEXAS

Confirmation Well Completed In Montague County

Eureka Oil Co. 1 Priddy, north offset to its 1 Lerner, discovery well of Lerner-Conglomerate field, has completed as a flowing well. On 24-hour test 1 Priddy gaged 175.13 bbl. of 43° oil through ¼-in. choke. Pay perforations were at 5,253-61 ft., tubing pressure was 300 psi. and gas-oil ratio 875:1.

Location of the well is 4 miles west of Nocona, in Block 45, William Ainsworth Survey, A-41.

Callahan County . . . Second well for the Elmdale pool, 8 miles southeast of Abilene, which produces from Palo Pinto reef, has been completed. Oxford & Stasney Drilling Co. 1 Stevenson flowed 71 bbl. of 39° oil a day through 12/64-in. choke. Tubing pressure was 180 psi., gas-oil ratio was 300:1. Produtcion was from open hole at 3,270-84 ft. Location is in Section 3, Block 8, SPRR Survey.

Nolan County outpost . . . Phillips Petroleum Co. 1 Chrome, southeast extension to Venamadre field in western Nolan County, reported oil and gas shows in the Ellenburger.

Drill-stem test at 7,241-61 ft., open 1 hour, produced a strong blow of gas and recovered 1 gal. of free oil, plus 248 ft. of oil and gas-cut mud. Sampletop on the Ellenburger was 7,200 ft. Location is in NW NW of Section 135-1A-H&TC Survey, 3 miles southwest of Maryneal. It is 1 location east of Sun Oil 1 Baker, which flowed gas only from perforations at 6,865-80 ft. On ⅝-in. choke, the well made 3,627 M.c.f. daily, and was testing.

Grayson County . . . Larson & Thomas 3 Clinton, 2½ miles northwest of Sherman, recovered water blanket, 3,645 ft. of oil and 315 ft. of oil and gas-cut mud

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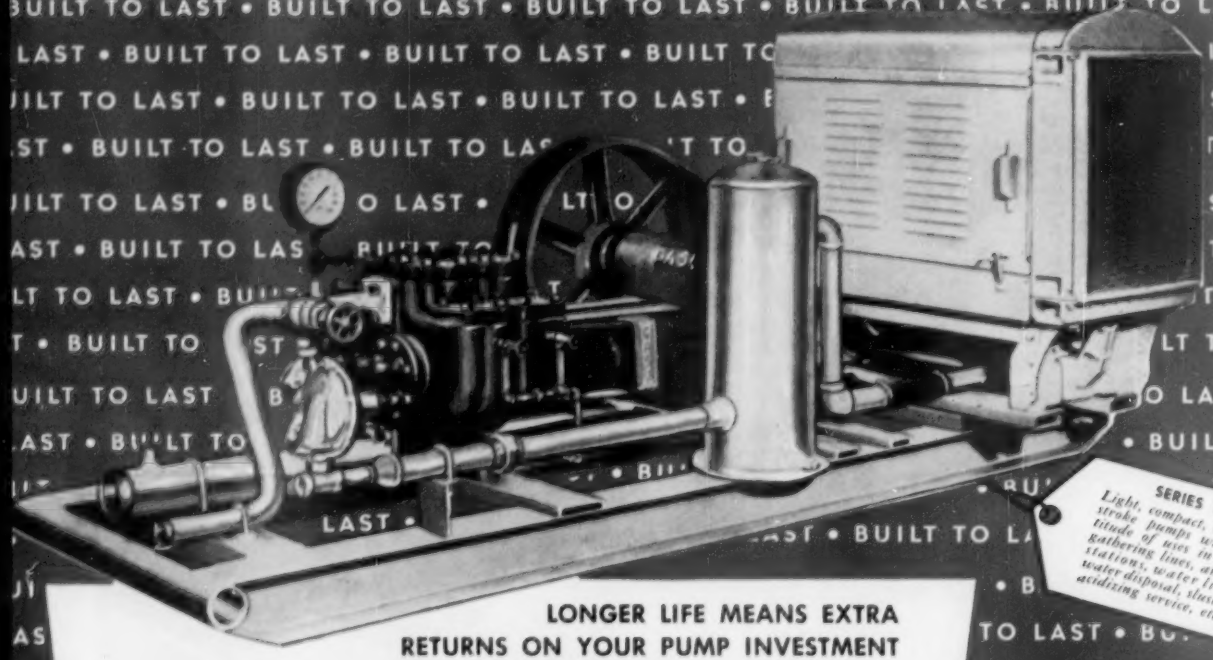

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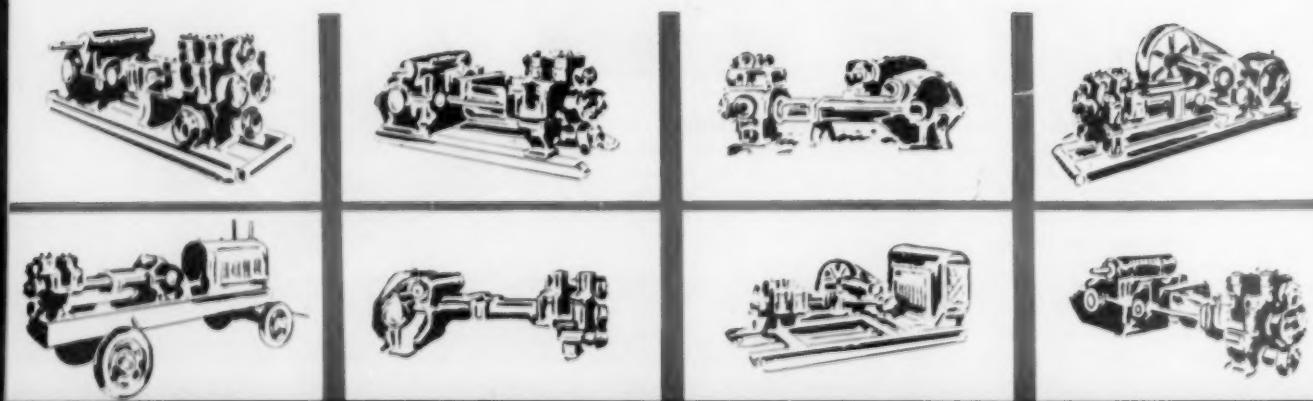

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on a 1-hour drill-stem test at 9,228-9,327 ft. Flowing pressure ranged from 1,150-1,475 psi. Operators drilled at head below 9,372 ft. Location of the well is a northeast extension attempt to the Cordell discovery.

WEST TEXAS-NEW MEXICO

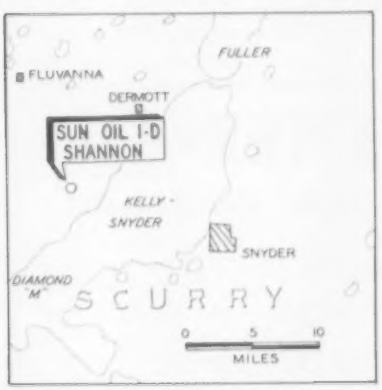
WEST TEXAS

Scurry County Ellenburger Discovery Flows Oil

Sun Oil Co. was ready to complete its Scurry County Ellenburger discovery, 11 miles northwest of Snyder, and about 3 miles west of Pennsylvanian reef production. The strike is 1-D Shannon estate, located in 331-97-H&TC Survey.

The well flowed heavily on a drill-stem test at 8,120-46 ft. Time on the test was not reported, but the well tanked 119 bbl. of 34.3° oil with no water in 6 hours, through ⅜ and ¼-in. chokes. Tubing pressure ranged from 1,775-3,430 psi., gas-oil ratio was 288:1.

Top of the Ellenburger was 8,114 ft. on elevation of 2,505 ft. Following perforations in casing at 8,117-49 ft.,



Late report on Sun Oil 1-D Shannon gave it a flowing potential of 522 bbl. daily, through 12/64-in. choke. Nearest Ellenburger oil is in Fluvanna fields, 10 miles north.

the well flowed 93 bbl. of load oil and 76 bbl. of new oil in 22½ hours through ¼-in. choke. Production was without acid; gas-oil ratio was 322:1.

Jeff Davis County . . . Gulf Oil Corp. has filed amended application to drill its 1-A W. L. Kingston, Jeff Davis County wildcat, to 11,300 ft. At last report the well was drilling below 10,458 ft. in lime and shale. Location is in 33-57-T9-T&P Survey, 23 miles north of Fort Davis.

Dora Roberts field . . . TXL Oil Corp. 1-X Midland Fee, first test to be drilled by the operating firm on acreage offsetting Dora Roberts production, was drilling ahead below 12,258 ft. last week. A drill-stem test from 12,178-12,232 ft. produced mud with a slight gas cut. Formation tops have not been reported but it was said to be running low on all markers. A drill-stem test around 10,600 ft., probably Strawn, showed good production possibilities. TXL's original hole in 1-X Fee was put down to 6,043 ft., where it was plugged, and the rig skidded 300 ft. west. Location is ½ mile east of the field discovery.

Forest and Cities Service 3 Roberts B-1, northeast offset to the field discovery, ran so low on the Ellenburger that operators plugged back at 12,832 ft. to make a Devonian well. Potential from perforations between 12,010-12,670 ft. was 370 bbl. of oil in 12 hours through ½-in. choke. Gas-oil ratio was 2,740:1 and gravity was 45°.

ARK-LA-TEX

EAST TEXAS

East Texas Area Map

East Texas Oil Map Co., 3704 Valley Ridge Road, Dallas, has issued a new

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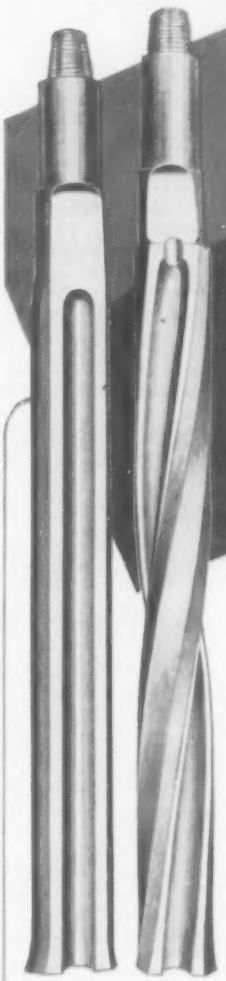

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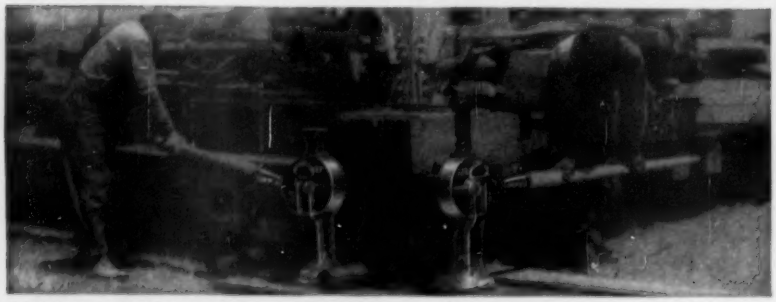

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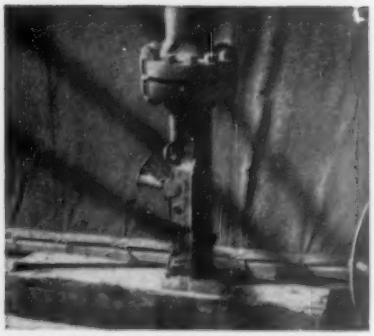

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map of the East Texas area. Scale is 1 in. to 7 miles, giving it an over-all size of 42 by 44 in.

Data includes oil and gas fields, with names; general outline of the Mexia-Talco and Balcones fault systems; counties, county seats, major highways and rail lines. Area covered extends from Tarrant County on the west to the Louisiana line, and the Red River on the north to Madison County on the south.

Anderson County Wildcat Has Woodbine Oil Shows

L. A. Douglas, San Antonio and L. A. Grelling, Tyler, 1 Bridges, Anderson County wildcat 2 miles southeast

Douglas and Grelling 1 Bridges, southeast of shallow Camp Hill field, had prospects of making a Woodbine discovery on the basis of drill-stem tests.

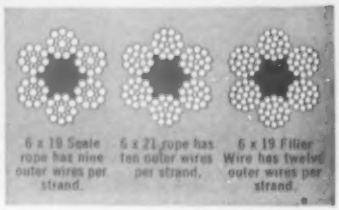
of Camp Hill field, reported finding saturated Woodbine sand.

Operators cored into the sand at 5,340 ft., and drill-stem tested to 5,345 ft., recovering gas and gas-cut mud. Further coring was said to have picked up the oil sand around 5,382 ft., and a drill-stem test was under way to that depth.

Dallas County test . . . Magnolia Petroleum Co. 1 Trigg estate, 7 miles west of Dallas, was coring limestone at 9,474 ft. last week, and operators had filed amended application to deepen the well to 10,000 ft.

Limestone County . . . Zephyr Oil Co. 1 Norris, prospective dual discovery, pumped 12 bbl. of oil a day from the Pettit zone at 5,413-64 ft. This section previously had flowed at the rate of 100 bbl. a day. Further tests will be made of the upper Glen Rose at 4,455-63 ft., and of the Bacon at 4,862-92 ft. The latter section showed oil on a drill-stem test.

Smith County . . . Carter-Gragg Oil Co., Palestine, has announced location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6 x 21 rope has ten outer wires per strand.
6 x 19 Filler Wire has twelve outer wires per strand.

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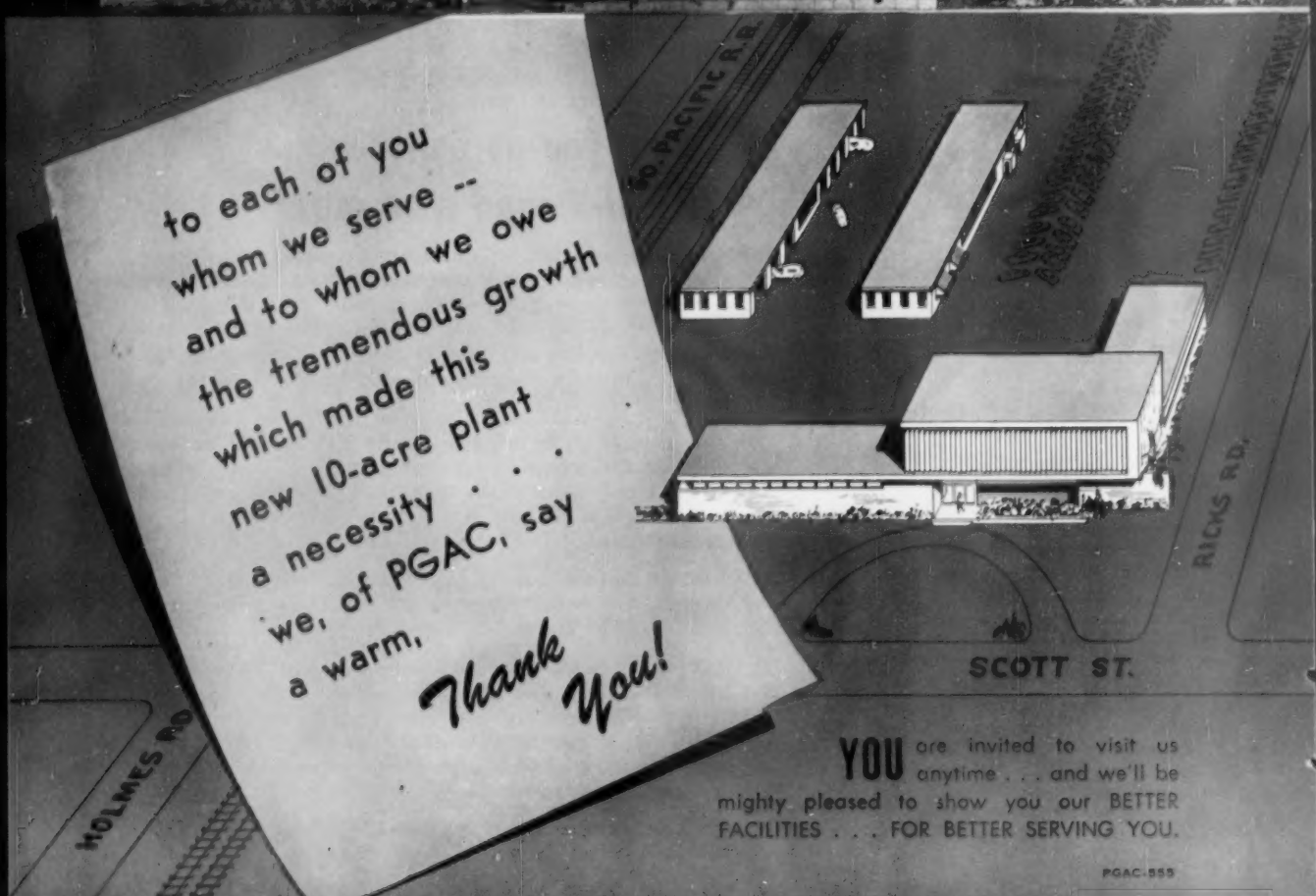

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for an 8,500-ft. wildcat to test the Pettit. The well will be 1 Gary, located 8 miles northwest of Kilgore in the Oscar Hawkins Survey, A-14.

ARKANSAS

May Discoveries Up In Arkansas Area

Exploration in Arkansas in May came up with one new oil field and extensions to two older producing areas.

West Willisville field was opened by N. B. Hunt at 3 Silvey, S½ NE NW 24-14s-22w, with production from the Tokio. The Nevada County discovery is 1⅞ miles west of Willisville, southwestern Arkansas. The well pumped at the rate of 83 bbl. of 21°-gravity oil per day from perforations at 2,135-45 ft.

Extensions . . . Parks & Meabon extended Travis Peak and Nacatoch production in Union County's Urbana field. The 1 Gwin, C SE NE NW 4-18s-13w, pumped 15 bbl. of oil from Travis Peak perforations at 3,387-91 ft.; the 2 Gwin, C SE SE NW 4, ¼ mile south, pumped 6 bbl. of oil per day from the Nacatoch at 2,283-2,337 ft.

NORTH LOUISIANA

Development Program Due at Ouachita Strike

Zach Brooks Drilling Co. had completed tests at his 1 Golson, 19-17n-2e, 1¾ miles northeast of Cadeville on the Monroe uplift of northeastern Louisiana's Ouachita Parish.

Testing is complete at Zach Brooks' 1 Golson, 19-17n-2e, gas and oil discovery 1¾ miles northeast of Cadeville in Ouachita Parish, northeastern Louisiana.

The well flowed at the estimated rate of 7 to 10,000 M.c.f. of gas per day plus 60 bbl. of 47.5°-gravity oil per million. Production is from Cotton Valley. The outcome of a planned confirmation well will determine the value of the new discovery.

GULF COAST

TEXAS GULF COAST

Open Flow Gage Reported At Offshore Gas Discovery

Magnolia Petroleum Co. has run an open flow gage of 38,000 M.c.f. per day at their offshore wildcat, 10 miles southwest of Sabine Pass off Jefferson County, Texas.

The A-2 Texas Gulf, Tract 9, was completed from 8,247-57 ft. It is on the same platform as the A-1 strike which got gas-distillate production at 8,016-30 ft. The A-3 well is under way from the same platform.

SOUTH LOUISIANA

Big Lake Field Extended Into Eastern Calcasieu Lake

Bik Lake field in Cameron Parish has been extended over into the eastern part of Calcasieu Lake by Stanolind Oil & Gas Co. Their 1 State Lease 2406, 2 miles northwest of the field, made 68 bbl. of distillate and 1,610 M.c.f. of gas per day on completion with a 9/64-in. choke.

Terrebonne Offshore Strike Is New Gulf Producing Area

A new oil field has been opened in South Timbalier Bay Block 54, off Terrebonne Parish in gulf waters. The Humble Oil & Refining Co. discovery made 420 bbl. of oil per day with 204.3 M.c.f. of gas on ⅛-in. choke from perforations at 6,591-6,605 ft.

Breton Sound . . . Another new field for the Breton Sound area off Plaquemines Parish has been opened by Kerr-McGee Oil Industries, Inc. at their 1-F State Lease 1999.

The Block 28 well flowed 240 bbl. of oil on 10/64-in. choke from perforations at 5,846-57 ft. The strike is located in Breton Sound Block 20.

APPALACHIAN

WEST VIRGINIA

In St. George district, Tucker County, West Virginia, Columbian Carbon Co., located C-1-1215 United States of America rank wildcat, elevation 1,639 ft., Parsons Quadrangle, 5.63 miles south of latitude 39 degrees 15 minutes and 2.88 miles west of longitude 79 degrees 35 minutes.

● Middle Fork district, Randolph County, W. H. Busch, an independent operator announced 1 Jessie McQuain, elevation 1,891 ft., Sago Quadrangle, .02 mile south of latitude 38 degrees 55 minutes and 4.0 miles west of longitude 80 degrees 00 minutes. Two development locations were made, Cumberland & Allegheny Gas Co. 530 H. S. and Maude Zickefoose and 537 Kathleen Leatherman.

OHIO

A wildcat in south central Knox Township, Holmes County, looks like a gasser. Diamond Oil & Gas 1 Donald Doty, Section 17, topped the Clinton at 2,963 ft. and was drilling at 2,976 ft. with a gage of 620,000 cu. ft.

● An extension of ½ mile to the new production north of Killbuck in Killbuck Township, Holmes County, was completed by Blain Woods on 1 H. E. Snyder, Section 5. Clinton at 3,351-62 ft. made 80 bbl. after fracture treatment.

● In Union Furnace field, the T. W. Carroll 1 (4), Section 13, Washington Township, Hocking County, logged the Clinton at 2,933-64 ft. with 5 bbl. natural and 75 bbl. and 800,000 cu. ft. gas after fracturing.

The fourth discovery well has been completed in Bethlehem Township, Coshocton County, this one in the northeast part. National Gas & Oil 1 J. G. Lawrence, Lot 23, first quarter,

LEGAL

Sealed bids will be received until 1:00 P. M., Monday, June 20, 1955, and opened at that time at the Shawnee Indian Sub-Agency for the leasing of allotted Indian lands located in Pottawatomie, Cleveland, Lincoln, and Payne Counties, Oklahoma, for oil and gas mining purposes. For additional information write or telephone Mr. Robert D. Grover, Area Field Representative, Shawnee, Oklahoma. (Telephone No. 3181.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that approximately 2838.04 acres of land in fifteen parcels, within the known geologic structure of Williams Park Anticline, Routt County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 p.m., M.S.T. June 30, 1955, when bids will be opened. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado. George H. Woodhall, Manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. By virtue of the authority vested in the President and pursuant to Executive Order No. 10355 of May 26, 1952 and Public Land Order No. 1062 of February 3, 1955, notice is hereby given that 5 parcels of land, containing 1603.20 acres situated within the Camp Wallace Military Reservation in Galveston County, Texas, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.D.T., on July 6, 1955 when bids will be opened. Details of the lease offer, description of the lands with a plat showing the approximate location thereof, how and where to submit bids, and bid forms may be obtained from the Oil & Gas Supervisors of the Geological Survey at 239 Federal Building, Tulsa, Oklahoma, and 333 St. Charles Avenue, New Orleans 12, Louisiana, or from the Washington office of the Bureau of Land Management or the Land Office at Santa Fe, New Mexico. L. E. Hoffman, Minerals Staff Officer.

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found the Clinton at 3,631-3,700 ft. with only a show of gas natural but increased to 1,500,000 cu. ft. in a 24-hour test after the fracture treatment.

● A second producer confirmed the north extension of Marne pool in Madison Township, Licking County. Denney Beisser et al. 1 C. H. Priest, Lot 6, first quarter, logged the Clinton at 2,659-2,707 ft. and made 81 bbl. oil and 300,000 cu. ft. gas after fracturing.

A 1-mile east extension to the new pool in Jefferson Township, Coshocton County, was brought in by W. E. Shrider on 1 W. A. Bickle, Section 7. Clinton was reported at 3,245-3,297 ft. with 600,000 cu. ft. when first drilled and shut in natural at 300,000 cu. ft.

EASTERN KENTUCKY

In Leslie County and located on Beech Fork, United Fuel Gas Co. is reaming hole at 2,424 ft. at their wildcat 16 Fordson Coal Co. Gas at the rate of 169,000 cu. ft. daily was recorded from 2,396 to 2,405 ft. in the Mississippian Big lime sequence. A 40-hour rock pressure test showed 560 psi.

GREAT LAKES

MICHIGAN

Reworked and acidized in the Detroit River "sour zone" after being produced from the Dundee since 1944, Cities Service Oil Co. B-1 Methner, NW SE NW 33-16n-3w, Wise field, Isabella County, offered excellent prospects for other completions in this horizon, either by deepening older Dundee oil wells or by drilling new holes all the way to this pay zone.

Well was reworked in lower pays at 4,426-32 and 4,436-42 ft. Section between 4,415 ft., 5-in. casing point, and 4,463 ft. was acidized with 1,000 gal. After acid, well flowed back 44 bbl. of oil no water, in 5 hours through ⅛-in. choke; 33 bbl. in 24 hours through ¼-in. choke; 30 bbl. in 3 hours on various days; and last reported gage was 33 bbl. of oil and 9 bbl. of water in 24 hours. Further tests were being run to determine if watercut was coming from the bottom of the hole or if it was a delayed return of acid water.

● Cores recovered from Richfield up to 5,125 ft. at the Gordon Drilling Co. 1-A Bell, SW NW SE 2-17n-2w, Beaverton Township, Gladwin County, appeared to offer good prospects of a Richfield pay well at this deep test on the northeast side of the old (and now abandoned) Beaverton Dundee oil pool.

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Quarrying for first plant—Walteria

a quarter of a century separates these DICALITE pictures

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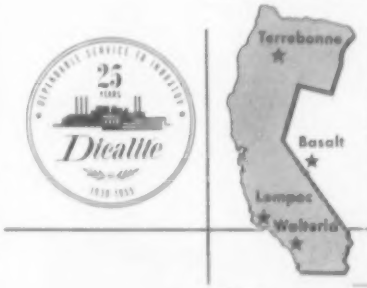
And Dicalite itself has grown—because of this basic idea of development—from 1930's one deposit, one plant, to 1955's four processing plants and deposits in three states. Four locations, four plants, served by four different railroad systems, insure a continuing, *dependable* supply of the diatomaceous materials upon which many industries rely.



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Another core may be cut before casing is set.

• The second Dundee oil well, first follow-up to the Dundee discovery in the Birch Run Berea field, Birch Run Township, Saginaw County, was being tested by discoverer J. V. Wicklund, Jr., and associates, at the 2 Morse, W½ SE NW 20-10n-6e. Dundee top was logged at 2,531 ft. Hole was drilled to 2,608 ft., with pays showing at 2,541-53; 2,562-64; and at 2,585-90 ft. Well was rated good for 1 bbl. of oil a day natural and tubing was being set in preparation for a fracturing treatment of the Dundee section.

• Ace Oil Co. started cable tool deepening, with the Dundee at about 3,000 ft., as its new objective, at the A-1 Butler, SW NE SE 7-11n-11w, Ensley Township, Newaygo County, a small Traverse oil producer in the Ensley Traverse oil pool—first Dundee test since field was opened for Traverse development.

ROCKY MOUNTAIN

COLORADO

Bent County Wildcat Is Apparent Discovery

M. J. Stansbury, Bakersfield, Calif., independent, is testing an apparent discovery about 6 miles northeast of the town of Las Animas, Bent County. The well is on the Las Animas arch, where lease interest has recently been high but where no considerable amount of drilling has been done during the past 2 years.

The well, 1 Coordes & Oberlander, C SW SW 21-21s-51w, flowed at the rate of 2,000 M.c.f. of gas per day on

Pennsylvanian gas production is reported at a Bent County wildcat on the Las Animas arch in an undrilled area of southeastern Colorado.

drill-stem test at 4,625-45 ft. Tool was open 52 minutes, and flowing pressure at the end of this time was 300 psi.

Pipe recovery was 210 ft. of oil and

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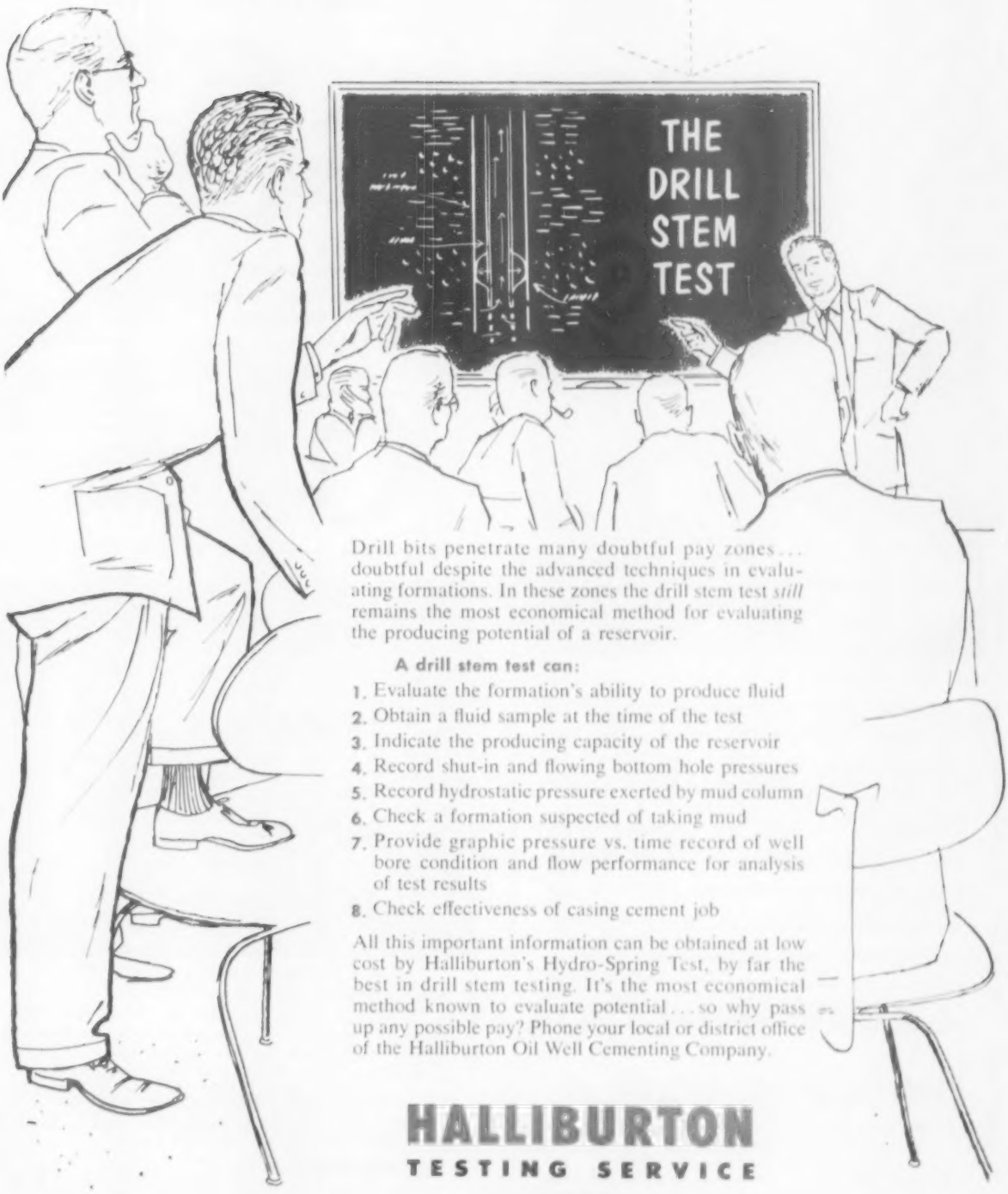

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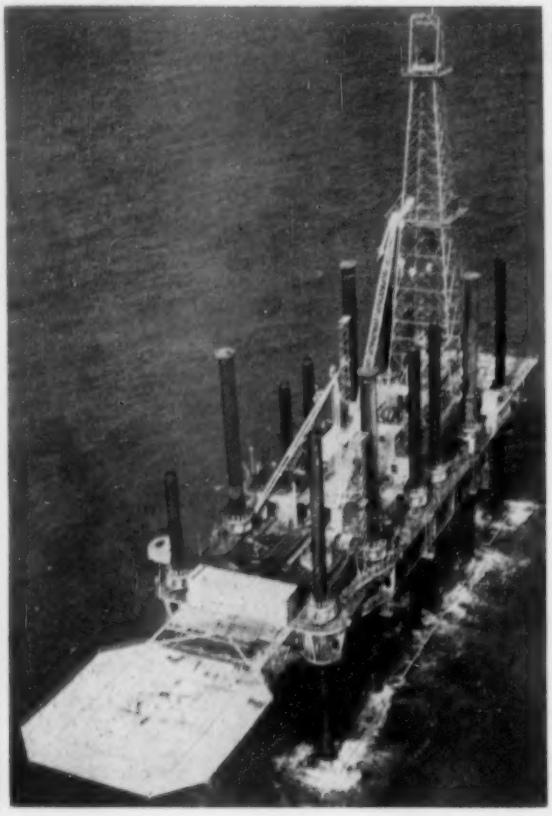

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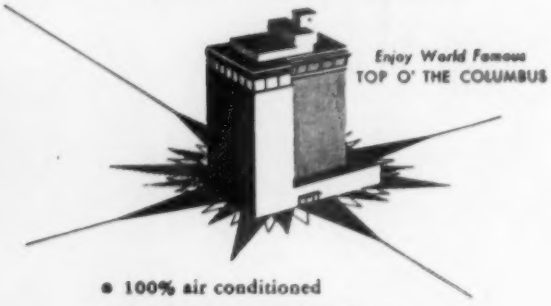

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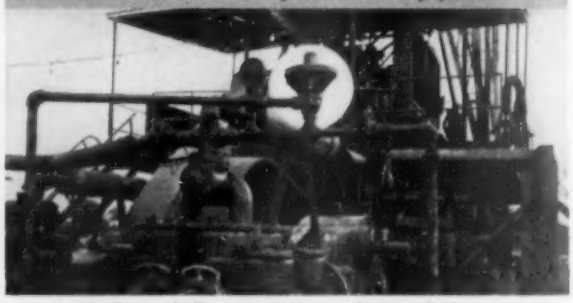

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160 ft. of oil-cut mud. Oil is 36.4° gravity. The operator has not reported tops, but the recovery is credited to either Atoka or Des Moines (Pennsylvanian).

A core at 4,796-4,806 ft. recovered 6 ft. of tight sand with oil stain, and 4 ft. of shale. The operator was last reported running drill-stem test of this zone.

The well is in an area which has had no previous drilling. A discovery was drilled by Continental Oil Co. in 1952 at 1 McClave, SE SE SE 1-20s-49w, in the southwest Eads area of Kiowa County. This well was completed for a flow of 357,000 cu. ft. of gas per day, and Continental has done no further drilling in the area since the program of 2 years ago ended.

Bent County has one other active location. El Paso Natural Gas Co. has started operations at 1 Swift, C NE NE 6-24s-51w, with no data now available.

Leasing through the general Las Animas arch area was active before the apparent discovery was reported. According to unofficial reports it is now somewhat increased, with more than 2,000,000 acres recently reported taken by a long list of operators active in the area.

NORTH DAKOTA

Bottineau County Wildcat Near Test

Cardinal Drilling Co. is preparing for test of 1 Union Central Life Insurance, C SE SW 1-163n-8w, Bottineau County. Test of the wildcat at 3,376-91 ft. recovered 200 ft. of free oil and 29 ft. of oil and gas-cut mud. The well is 6 miles west and south of production

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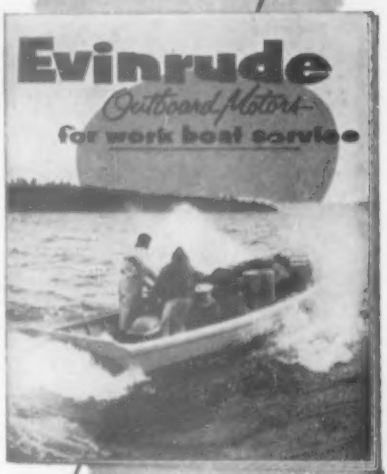

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in North Westhope pool, and 5 miles northwest of Westhope field. There has been no previous drilling in the immediate area.

Lion Oil to Drill Bottineau County Test

Lion Oil Co. has made location for 1 Sharpohl, SE NW 33-164n-77w, Bottineau County. The wildcat is 2 miles northeast of a failure drilled by this operator some time ago, and ½ mile east of a failure drilled on farmout from Lion. The firm holds a substantial amount of acreage through the area, but has done no recent drilling there.

MONTANA

New Cedar Creek Anticline Discovery Indicated

Shell Oil Co. recovered 925 ft. of muddy oil, with 7 to 43 per cent mud content on test of 22-X-36 State, SE NW 36-8n-59e, Fallon County. The operator tested Mission Canyon at 7,194-7,250 ft. Tool was open for 2½ hours with a final flowing pressure of 450 psi.

The well is in the Pennel area, on the Cedar Creek anticline. It is almost midway between Cabin Creek and Little Beaver. Shell is drilling below 7,250 ft. The well is scheduled as a test of Red River (Ordovician) expected at 9,350 ft.

In previous drilling through this general portion of the anticline shows in Madison, whether apparently commercial or not, have been later followed by completions in Ordovician. Both Cabin Creek and Little Beaver production is from this formation.

Deep Eastern Montana Wildcat Started

Continental Oil Co. is drilling below 3,800 ft. at 1 Begger, C SW NE 34-12n-60e, in the South Phillips area of Wibaux County. The well is to test Ordovician at about 11,500 ft. It is the first wildcat east of the Cedar Creek anticline in the area between Wibaux and Fertile Prairie fields. Production is found in Ordovician at both these pools.

Blaine, Musselshell County Wildcats Staked

Amerada Petroleum Co. has made location for wildcats in Blaine and Musselshell counties. The firm will drill 1 NP-F, C NE NE 29-11n-25e, in the Devil's Basin area of Musselshell County. This wildcat is scheduled to Otter

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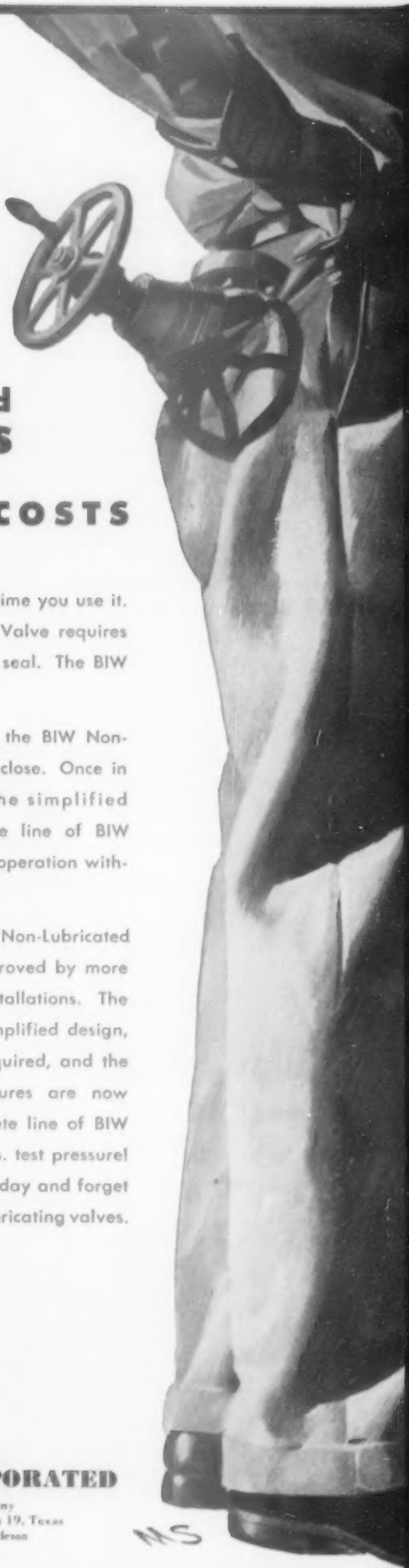

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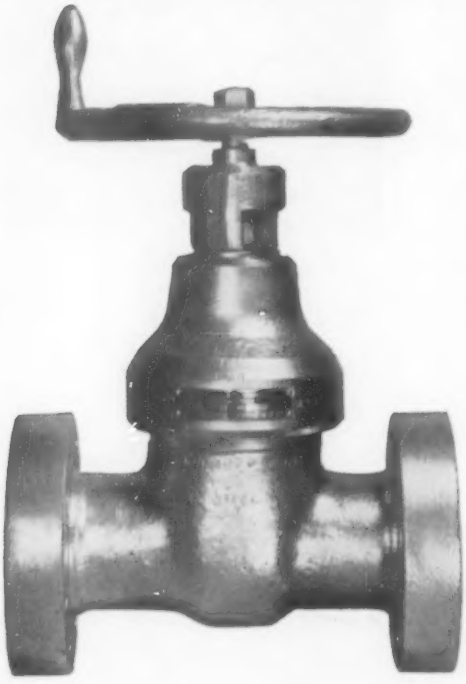

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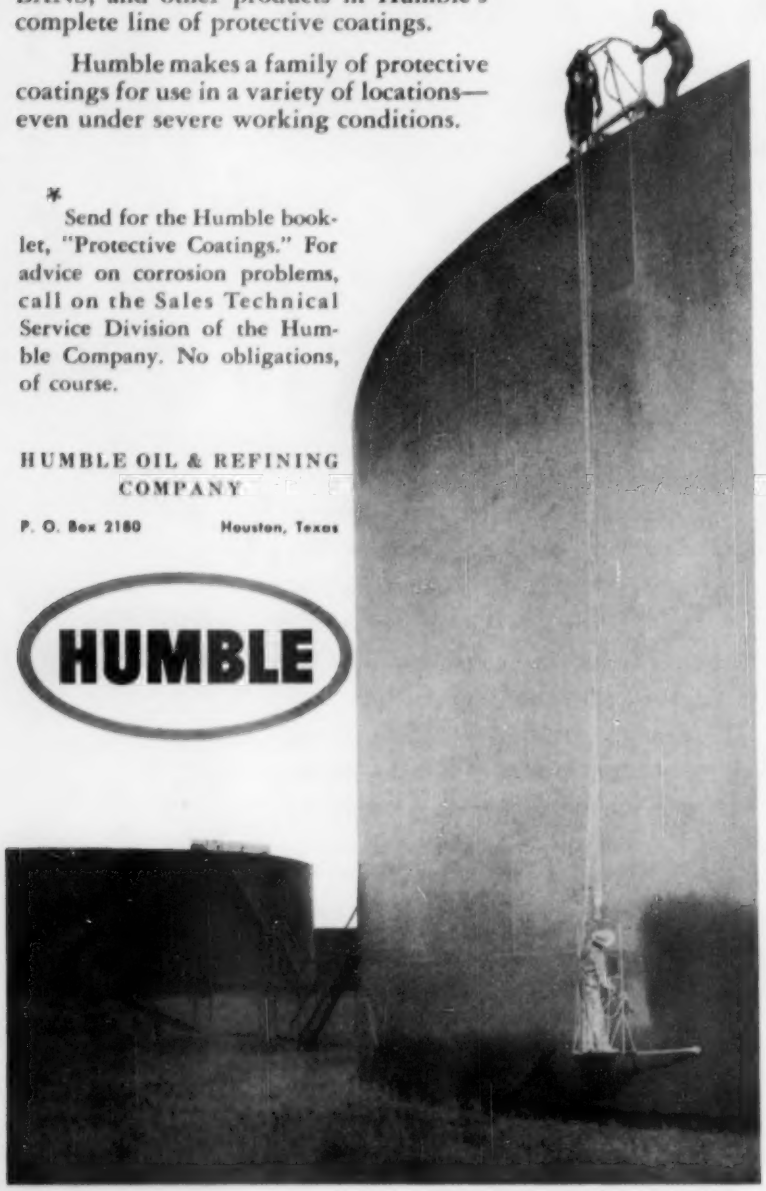

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at 3,500 ft. In Blaine County, Amerada has location for 1 Reed, C NW NE 4-34n-22e, in the Colby area.

Glacier County Wildcat Cores New Shows

Union Oil Co. of California has recovered additional Madison limestone with good stain and odor at 1 Morning Gun, C SW SW 18-31n-11w, in the Glacier Park area, Glacier County. The last core reported was of the interval 9,093-9,121 ft. Recovery was 28 ft. of limestone with good shows. The operator topped Madison at 8,959 ft. and has recovered gas at the rate of more than 1,000 M.c.f. per day on each of two tests between that depth and the present coring depth below 9,128 ft.

The wildcat is in the Disturbed Belt, southeast of Pincher Creek field in Alberta, and shows are similar to those found in the Canadian gas field.

WYOMING

Torrington Area Confirmation Completed

The Chicago Corp. and Republic Natural Gas Co. have completed a successful confirmation of the recent Torrington area discovery in Goshen County. The well, 1 Van Mark, C NE NW 4-23n-61w, flowed 120 bbl. of oil per day. Production is from sand perforations at 6,958-84 ft.

Park County Wildcat Scheduled to Deepen

Husky Oil Co. is moving in at 1 McCulloch Peak Unit, SE NW SW 21-54n-100w, Park County. The well will be deepened from an old total depth of 12,299 ft. to about 15,500 ft. Drilling was done in 1950 by Trigood Oil Co. and Hamm's Brewing Co. The original operators reported a slight show in First Frontier. The well is 15 miles south of production in the Ralston Unit.

West Salt Creek Wildcat Near Test

Stanolind Oil & Gas Co. has set pipe and is preparing to test at 1 Anderson, N½ NW NW 18-40n-79w, Natrona County. The operator recovered 40 ft. of heavily oil-cut mud, 120 ft. of mud and some water on 2-hour test at 2,558-2,600 ft. Core of the interval was sand with good shows of oil. The well is 2 miles west of Salt Creek field. Tops are not reported, but at total

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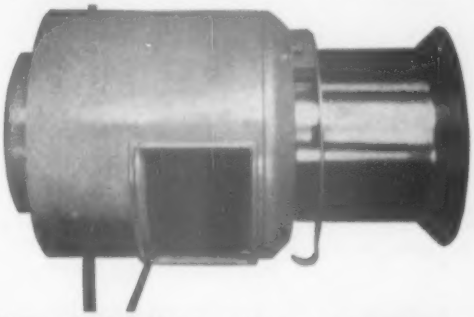

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depth of 2,600 ft. the well is reported in Second Wall Creek.

Test Reported at Northwest Byron Discovery

Phillips Petroleum Co. recovered 87 bbl. of oil and 37 bbl. of water in 24-hour pump test of 1 State-Lodestone, SW SW NW lot 37-56n-97w, Park County. The well is a Tensleep discovery, with production from perforations at 6,172-80 ft. It is 2 miles north and west of Byron field.

UTAH

New Wildcat Locations Reported

Carter Oil Co. has made location for a rank wildcat test in Uintah County, about 65 miles southeast of the town of Roosevelt. The well is 1 Minton-State, C NE SE 32-14s-20e. It is to go to a minimum of 8,500 ft. and is unofficially reported contemplating test of Weber at a depth in excess of 11,000 ft.

In Grand County, Cabeen Exploration, Inc., has made location for a Dakota test in the Cisco Dome area. The well is 1 State, C NE NE 36-20s-21e.

Another Apparent Paradox Basin Discovery Tested

Shell Oil Co. has tested another wildcat in southeastern Utah with apparent success. The company has made three discoveries in southeastern Utah-northern Arizona within the past 8 months. The new well is 1 White Mesa Unit, C NW NW 6-43s-24e, San Juan County. It is 7 miles east of Shell's discovery at North Boundary Butte, and southeast of the Desert Creek discovery.

Shell tested the interval 6,065-6,265 ft., and reported gas at the surface in 5 minutes, oil after 4¼ hours. Tool was open a total of 5 hours, 48 minutes, and flow was at the rate of 80 bbl. per day of which 48 bbl. was oil. The flow of gas ranged from ¼ to ¾ million cubic feet per day. The oil was black and sulfurous, and gas was sour. Tops below Hermosa at 4,695 ft. have not been reported, but the test is believed of a Pennsylvanian interval. Pennsylvanian has been the productive horizon in other discoveries in this general area.

NEBRASKA

New Kimball County Discovery Indicated

Shell Oil Co. has perforated at 6,800-30 ft. at 1 Schrack, C NE NW 18-13n-56w, Kimball County, and is running tests. The operator recovered 2,500 ft. of oil with 300 ft. of mud-cut oil on 2-hour drill-stem test at 6,801-32 ft. A test in J sand above this interval also recovered some oil. The well is between the Chaney and Schrack producing areas.

PACIFIC COAST

CALIFORNIA

Reserve Starts New Tejon Ranch Test

Reserve Oil & Gas Co. was under way with a wildcat 2½ miles northeast of Tejon Ranch production in southeast San Joaquin Valley. Located in SE NE 20-11n-19w, 63 Butler-Wehr was scheduled to drill to about 9,000 ft.

Along the northern edge of the Tejon field seven rigs were seeking the new Jewett sand pool. Five wells completed in the 7,000-ft. pay have proved production over a 1-mile northeast-southwest trend. Reserve 33-8 J. V. in SE NE Section 33, about ¼-mile southeast

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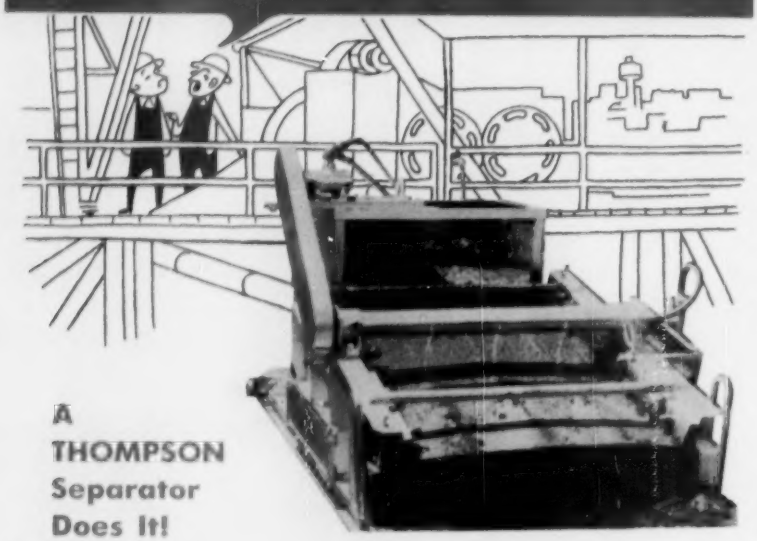

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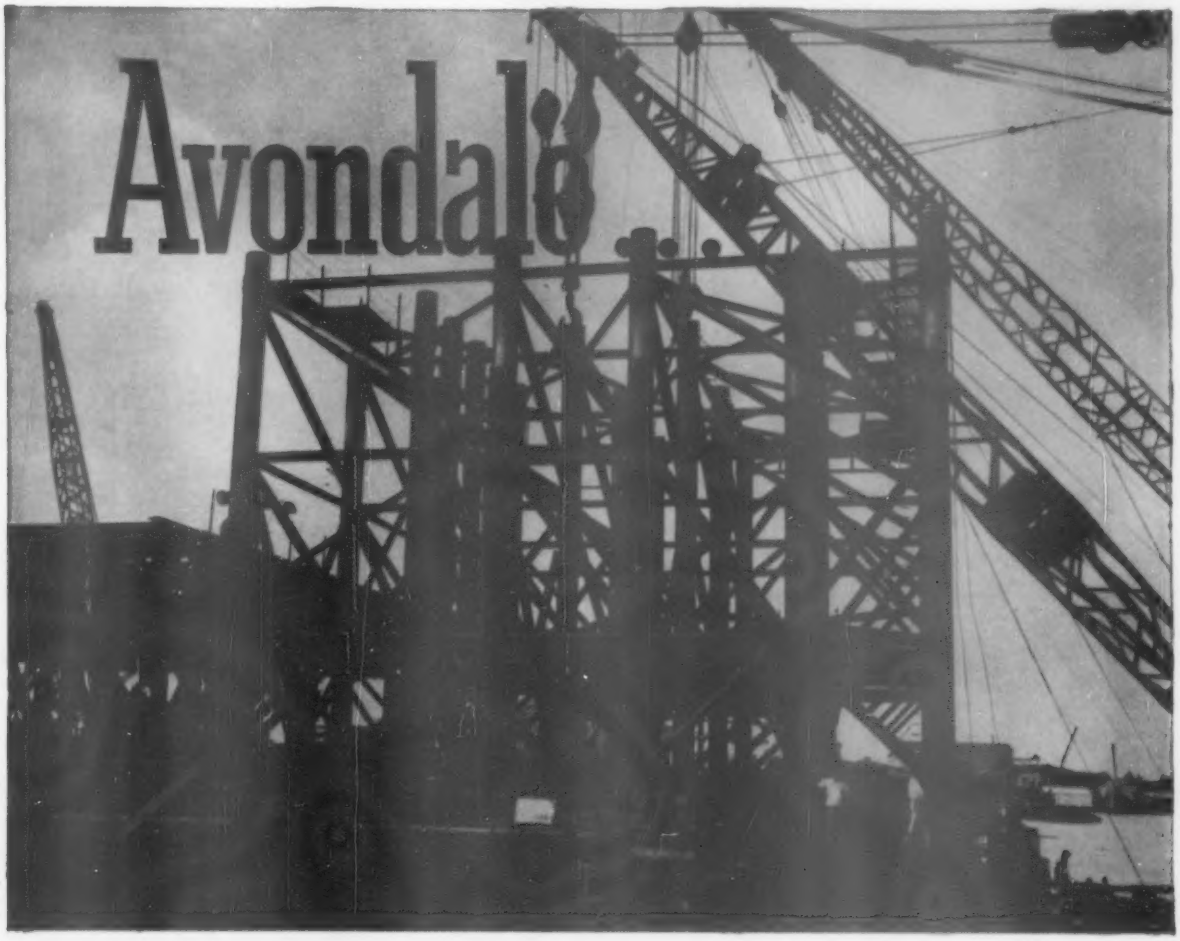

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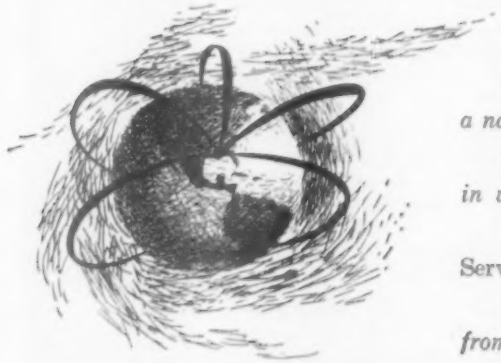

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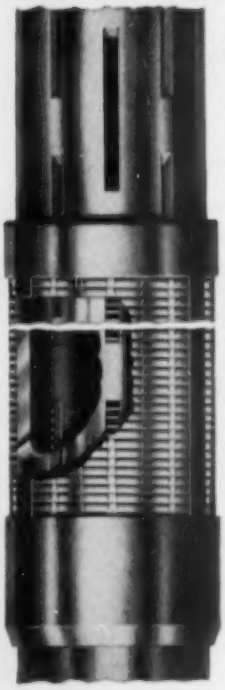

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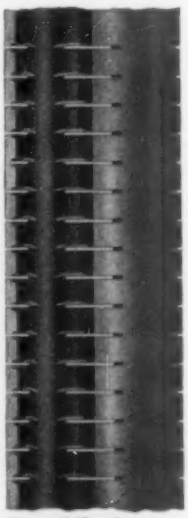

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of the discovery, found the zone to contain gas at 6,838 ft. It was being redrilled downstructure to the northeast in search of the oil section.

About ⅜-mile north of the discovery area, Humble Oil & Refining Co. 1 Anne Newlon and Intex Oil Co. 88-28 Blodget-Crome were seeking the deep pay. Their completion will shed much light on extent of oil production.

Deep West-Side Test

Standard Oil Co. of California was preparing to start a deep test, possibly to 13,000 ft., near Buttonwillow on the west side of San Joaquin Valley. Labeled 341 Van Wy, it will be located 2 miles southeast of South Belridge in NE NE 8-29s-22e. It reportedly will seek Eocene production.

BASIN AND RANGE

NEVADA

Nevada Outpost Dry

Shell Oil Co. 58-26 Eagle Springs in Nye County, northeast Nevada, was abandoned at 8,300 ft. after electric logs and sidewall samples were taken. The well was about ⅓ mile northeast of the discovery Shell scored there last year.

WESTERN CANADA

ALBERTA

Redland Area Wildcat Is Viking Gas Strike

Socony-Vacuum Oil Co. of Canada, Ltd., has made a gas discovery in the Viking sand at their wildcat in the Redland area of southern Alberta.

The new gas area is 50 miles northeast of Calgary and 13 miles southwest of Drumheller. The well, Socony-CPR 1-14 Redland, LSD 14, 1-28-22w4, is 11 miles southwest of West Drumheller Devonian oil field. Gas was found on two drill-stem tests in the Viking, which was contacted at about 4,100 ft. The first test, bottomed at 4,156 ft., flowed gas at the rate of 728 M.c.f. per day. The second test, bottomed at 4,211 ft., made 3,560 M.c.f. of gas per day. Crew is drilling ahead below 4,800 ft.

Westward Ho Report

Hudson's Bay Oil & Gas Co., Ltd., and the Home-Federated-Alminex team have run an initial potential test at the first follow-up to the Westward Ho Mississippian oil discovery well, and are carrying out production tests at a

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third well in the same area. This project lies 17 miles west of Olds and 55 miles northwest of Calgary.

The follow-up well, Hudson's Bay-Oilwell Operators 15-5 Westward Ho, LSD 15, 5-33-4w5, perforated and acidized in the Mississippian, and rated an initial potential of 450 bbl. of clean oil per day on 20/64-in. choke. The well is ½ mile south of the discovery well.

The third well, Hudson's Bay-Oilwell Operators 3-8 Westward Ho, LSD 3, 8-33-4w5, is ⅜ mile southwest of the discovery and the same distance northwest of the 15-5 well. On production test the 3-8 well, after perforating and acidizing a 17-ft. section in the Mississippian, flowed oil at the rate of 422 bbl. per day.

SASKATCHEWAN

Light Gravity Crude Strike Reported at Ralph

Socony-Vacuum-Central Leduc - Del Rio unofficially reported a light-gravity crude oil discovery at a wildcat in the Ralph area of southern Saskatchewan, 12 miles southeast of Weyburn.

This well, Socony-Central-Del Rio 28-2 South Ralph, LSD 2, 28-6-13w2, is 4 miles south of other Ralph area wells. The South Ralph prospect has run three tests in the Mississippian, recovering clean oil on each, according to reports. Recoveries on those tests, which covered a 25-ft. section in the oil pay zone, showed up to 300 ft. of clean oil. Crew on this hole is now coring below 4,523 ft., preliminary to further testing.

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SOUTHWEST TEXAS

Gonzales County: A. T. Jergins 1 W. K. Tenberg, Wm. Newman Sur. A-362. IPF 150 BOPD, ¼-in. choke, perfs. 3,341-42 ft., 24°. TD 3,605 ft. (Discovery of Pilgrim field).

Hays County: Woodward & Co. 1 David Schubert, Otis Eeels Sur. A-167, Lot 26. IPP 2 BOPD, open hole in Austin chalk 741-65 ft., 25°. TD 3,398 ft. (Oil discovery well).

SOUTHWEST TEXAS
District 4

Aransas County: Heep Oil Corp. et al 5 Zeph Roquette et al, J. G. Smith Sur. A-239. IP 25,000 M.c.f. of gas per day, open flow, GOR 40,000:1. Middle "H" pay 8,615-22 ft. TD 8,833 ft. (New pay discovery).

Hawn Bros. 6 Mestena Oil & Gas Co., La Mestena y Gonzalena Grant. IP 7,200 M.c.f. of gas per day, open flow, GOR 49,500:1. Frio pay 6,248-54 ft. TD 7,025 ft. (New pay discovery.)

Duval County: M. M. Miller & Sons E-1 Miller Fee-E, Agua Poquita Survey, Santos Flores Grant. IPF 21 BOPD, 5/32-in. choke, 39.8°, GOR 7817:1, perfs. 4,546-53 ft. TD 5,432 ft. (Oil discovery well).

Nueces County: Geo. W. Graham et al 1 Elliott, Bishop Subd. Petronilla Ranch. IPF 94 BOPD, 7/64-in. choke, 42°, perfs. 7,676-80 ft., GOR 4180:1. TD 8,565 ft. (Discovery well).

GULF COAST
District 2

Lavaca County: Lloyd H. Smith, Inc., 1 Sie Nolen, J. P. Smith Sur. A-424. IP 63 BOPD, 12/64-in. GOR 8700:1, perfs. Wilcox sand 7,874-78 ft., 35°. TD 8,057 ft. (Discovery of Hope South 7,870-ft. sand field).

EAST TEXAS

Cherokee County: P. G. Lake, Inc. et al 1 Phillips, G. Stokes Sur., A-771, 4 mi. NE Mount Selman. IP 15,000 M.c.f. gas, open flow, GOR 129,000:1, 67.6°, shut-in pressure 1,736 psi., pay sub-Clarksville 4,418-30 ft. TD 4,587 ft. Proposed name, Mount Selman.

WEST CENTRAL TEXAS

Stonewall County: Paul F. Barnhart and S. B. Roberts 1 Boyd, 11-D-H&TC, 6 mi. NE Aspermont. IPP 62 BOPD, 39°, GOR 375, conglomerate pay 6,143 ft. TD 6,153 ft.

Taylor County: Gilchrist Drilling Co. 1 Ely, J. W. Page Sur. 123, 3 mi. W Tye. IPP 88.9 BOPD, 40°, GOR zero, Tannehill sand 2,325 ft. TD 2,338 ft.

NORTH TEXAS

Archer County: Morgan Brothers 1-Z Turbeville, Blk. 155, R. Carson Sur., A-89, 9 mi. NW Archer City. IPP 85 BOPD, 41°, GOR zero, pay 1,510 ft. TD 1,513 ft.

Clay County: Brown & Scarber Drilling Co.

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1 Roop, Blk. 10, A. E. Gossett Sur., A-170, 10 mi. NE Wichita Falls. IPP 18 BOPD, 38°, GOR zero, pay 345 ft. TD 353 ft.

Grayson County: Ralph J. Abbey 1 Brooks, E. Tucker Sur., A-1194, 7 mi. NE Sadler and ¾ mi. SW Sadler-Big Mineral field, originally drilled dry to 8,395 ft. Recompletion IP 188 BOPD, pumping, 36°, GOR 200, Pennsylvanian sand 7,268-80 ft. TD 8,395 ft.

Young County: Jim-Lee Drilling Co. 1 Washburn, Sec. 1114, TE&L Sur., 4 mi. SW South Bend. IP 90.3 BOPD, 10/64-in., 41°, TP 95 psi., Strawn 1,899 ft. TD 3,100 ft.

WEST TEXAS

King County: Shell Oil Co. 5-C Burnett estate, 29-3-BS&F Sur., 10 mi. SE Guthrie. IPP 195.7 BOPD, 33°, top pay 5,440 ft. TD 6,400 ft., elev. 1,841 ft.

MICHIGAN

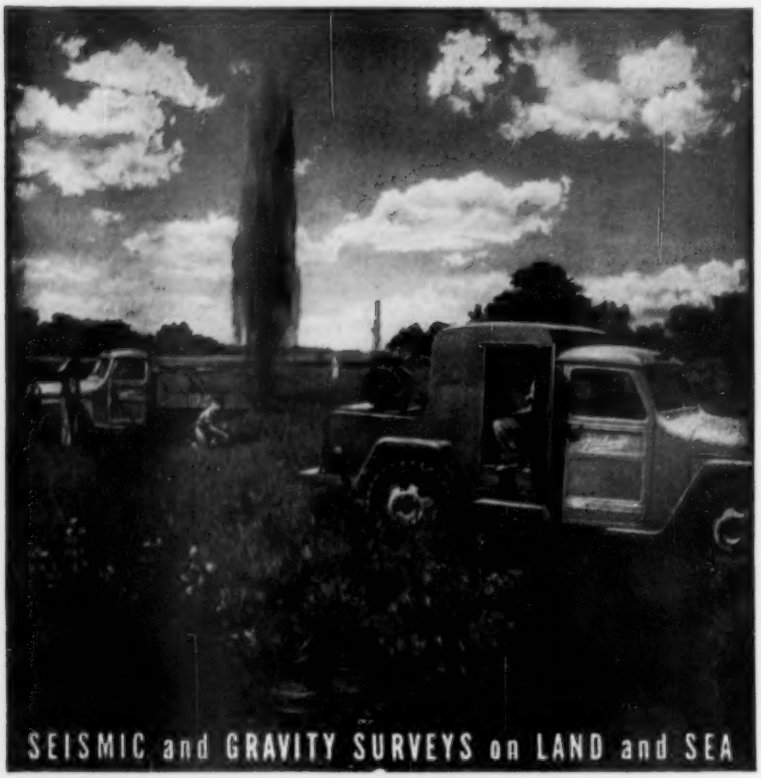
Osceola County: C. W. Jetter 1 Bregg, N½ NW SW 5-17n-10w. IPF 156 BOPD, Detroit River "sour zone" 4,184-4,257 ft. TD 4,618 ft. Dry in Richfield. PBTD 4,383 ft. (New pay in Reed City pool).

MISSISSPPI

Jefferson County: Eagle-Jett-Alagood 1 Walser, 25-8n-1w. IPF 84 BO 19 hours, 12/64-in. 39°, perfs. 5,586-87. TD 5,659 ft. (Oil discovery).

SOUTH LOUISIANA

Acadia Parish: Vincent & Welch, Inc. and Geo. McGhee 1 Miller, 13-8s-1w. IPF 165 BOPD, 9/64-in., 33.6°, GOR 797:1. Homeseekers pay 10,186-91 ft. TD 10,570 ft. (Oil well, new pay in Northwest Maxie area).



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Cameron Parish: Stanolind Oil & Gas Co. 1 State Lease 2406, Calcasieu Lake. IPF 68 BCPD, 1,610,385 cu. ft. gas per day, 9/64-in., GOR 32,865:1, 40.8°, perfs. 13,088-098 ft. TD 13,169 ft. (Gas-condensate well, new pay in Calcasieu Lake).

Jefferson Davis Parish: Bates & Cornell 3 King Corp., 30-7s-6w. IPF 750 M.c.f. of gas per day, dry gas, 9/64-in., perfs. 4,947-49 ft. TD 7,216 ft. (New gas pay).

Lafourche Parish: Natural Gas & Oil Corp. and Humble Oil & Refining Co. 1 Lafourche Parish School Board, 16-19s-23e. IPF 240 BOPD, 8/64-in., 39.5°, GOR 700:1, perfs. 9,755½-60½ ft. TD 12,510 ft. (Oil discovery).

Extension oil well at Bully Camp: Humble 5 Delta Section Co., Inc., 26-18s-20e. IPF 283 BOPD, ¼-in., 164 M.c.f. of gas per day, 34°, GOR 581:1, perfs. 11,446-64 ft. TD 12,072 ft. (Extension discovery).

Plaquemines Parish: John W. Mecom and Freeport Sulphur Co. 1 LL&E-Unit A, 32-19s-27e. IPF 211 BOPD, 12/64-in., 33.5°, GOR 1334:1., perfs. 13,978-90 ft. TD 15,500 ft. (Oil discovery).

Vermilion Parish: Columbia Carbon Co. 1 Vermilion Irrigation Co., 32-11s-2w. IPF 240 BOPD, 780 M.c.f. of gas per day, 10/64-in., 39.4°, GOR 3250:1. Alliance of Oligocene sand perfs. 10,792-96 ft. TD 11,248 ft. (North extension and new pay at West Gueydan).

ARKANSAS

Franklin County: Arkansas Western Gas Co. 1 Oscar White, 20-11n-27w. Dual gas discovery. IP 1,250 M.c.f. open flow gas per day, Atoka perfs. 1,751-63 ft. 2,743 ft. (Opens Jetho gas field.)

OKLAHOMA

Pottawatomie County: Magnolia Petroleum Co. 1 McGee, SE SW SE 24-8n-3e, 1¼ miles nortwest of St. Louis field. IPP 56 BOPD, Hunton lime 4,500-20 ft., 32°. TD 5,225 ft. (Oil discovery).

KANSAS

Barber County: Globe 1 Goemann, NW NE NW 29-32s-10w. IPF 16 BOPD, 2,000 M.c.f. of gas per day, Mississippian 4,433-40 ft., 28.7°. TD 4,965 ft. (Opens Geomann pool).

Kingman County: Magnolia Petroleum Co. 1 L. M. Wells Unit, CW½ SE SW 17-30s-8w. IPF 10 BOPD, 1,640 M.c.f. of gas, Miss. 4,172-84 ft., 31.5°. TD 4,275 ft.

Rice County: Herbel 1 Guldner, SW NE SE 17-18s-9w. IPP 13½ BOPD, Arbuckle 3,251-58 ft., 40°. TD 3,258 ft. (Opens Guldner pool).

CALIFORNIA

Glenn County: General Petroleum Corp. 30-1 Capital, NE 30-20n-2w, IPF 890 M.c.f. gas, 18/64-in. choke, perfs. 4,812-75 ft., TD 7,963 ft., PB 5,600 ft. (New pool discovery 1½ miles south of Willows gas field.)

General Petroleum Corp. 17-2 Capital, SE 17-20n-2w, IPF 4,600 M.c.f. gas 36/64-in. choke, tubing press. 777 psi., perfs. 5,646-95 ft., TD 5,696 ft. (New pay zone in Willows gas field.)

Los Angeles County: General Exploration Co. 9 C.W.O.D., SE NW 17-2s-12w, IPF 154 BOPD, 39.4° gravity, 18/64-in. choke, Buckbee zone 6,335-92 ft., O'Connell zone 6,575-6,688 ft., TD 8,553 ft., PB 6,688 ft. (New deeper pool discovery in Bandini field.)

WESTERN CANADA

Sun 6-35 Pine, LSD 6, 35-31-22w4. Indicated basal quartz oil well. TD 4,861 ft.

Farmer Hits in Oil

Husky president went broke in Canadian wheat fields

HUSKY OIL CO. of Cody, Wyo., in 17 years has grown from a small refining outfit to a fully-integrated oil company with interests in far corners of the world. The story of this spectacular rise also is the story of Glenn E. Nielson, who founded the company in 1938 and has directed its fortunes ever since.

Nielson abandoned a hard-luck career in farming and ranching to enter the oil business at the bottom. Years of drought and depression in Canada made Nielson turn from the soil.

He was born at Aetna, Alberta, and was reared on the family sheep ranch near Cardston, Alberta. As a high school boy he helped his father, James E. Nielson, operate the ranch. He liked it and decided on a career in agriculture.

Nielson entered the University of Alberta in 1919. But his college career was interrupted several times by economic necessity. Nielson each time returned to ranching to finance further schooling. He finally was graduated from the University of Alberta in 1933 with majors in agriculture and economics.

Abandons one career . . . Young Nielson in 1928 had married Olive Wood at Cardston and by the time he got his degree had three children. So he turned to ranching in earnest. Those were the dark years in farming. For 3 years drought was so severe Nielson didn't put a binder in his wheat fields. In other years the wheat only brought as little as 10 cents a bushel on the market.

Nielson then got out. Years later he explained why: "I majored in agriculture and economics, but when the economics went out of agriculture I went out of it too."

He took a job as salesman for a little oil refinery in northern Montana. In 2 years the refinery's output doubled —from 300 bbl. daily to 600 bbl. By 1937 Nielson felt he knew enough about the business to buy his own refinery—a small plant at Cody. He organized the Husky Refining Co., now Husky Oil Co., and was on his way.

Husky goes forward . . . Under Nielson's push, the new company enlarged its range of products, found new markets, and acquired production. Husky finally became fully-integrated. Today it has a daily production of about 5,500 bbl. in seven states. It markets its light-end products in eight states through a wholly-owned marketing-subsidiary, H. Earl Clack, Inc.

Husky also owns three other subsidiaries: Trans-Tex Drilling Co., Longview, Tex., and two steel warehousing and fabricating firms, Gate City of Omaha and Gate City Steel, Inc., of Boise.

The firm also has stepped outside the United States. Husky expanded into Canada in 1947. That successful branch of the firm owns and operates three refineries and has extensive oil holdings in western Canada. Husky also holds a substantial interest in Israel-American Oil Corp.

Nielson has carried into the oil business one habit he formed while ranching and farming. He gets a good start on the day's work "before the sun is high in the heavens." His car is one of the first to roll into the company parking lot at Cody and one of the last to leave.

This work habit is a necessity, for Nielson not only is president of Husky Oil Co. but also is president of Husky Oil & Refining, Ltd., Canada, and a director of Northern Natural Gas Co. and Israel-American. He also is a member of the National Petroleum Council, a director of the American Petroleum Institute, and chairman of the A.P.I.'s special committee on asphalt.

Nielson, however, shares his energy and enthusiasm with other endeavors. Church and civic affairs and his family share his attention. The Nielsons have five children and one grandchild. Two of the children are still at home. The other three have graduated from college.

William W. Gibson, geologist with Magnolia Petroleum Co. at Morgan City, La., has been transferred to the company's offices at Dallas.

Fred D. Davis, assistant superintendent of the West Tulsa refinery of The Texas Co., has been transferred to the company's refinery in Lockport, Ill., as assistant superintendent. **James A. Ruth** has been named chief engineer of the West Tulsa works, transferring from a similar position in The Texas Co. refinery at Port Neches, Tex.

R. L. Chatham, former process engineer with Eastern States Petroleum Co. at Houston, has resigned to join Atlas Processing Co. at Shreveport.

Stewart P. Coleman, a director of Standard Oil Co. (N. J.), has been elected a vice president. Coleman began his oil career in 1920 as a chemical engineer with Humble Oil & Refining Co. He joined Jersey Standard in 1933 as manufacturing representative on the company's coordination committee. He was named chairman of the committee in 1934.

T. F. (Tom) Fitzgerald, marketing vice president for the former Mid-Continent Petroleum Corp., has been named executive vice president for marketing of D-X Sunray Oil Co., subsidiary of Sunray Mid-Continent Oil Co. Fitzgerald has been associated with the D-X organization since 1917. Other appointments made by D-X Sunray include: **D. C. Wixson,** general sales manager for Mid-Continent, named vice president of retail marketing; **J. B. Smith,** formerly vice president and manager of sales for Sunray Oil Corp., named vice president of wholesale marketing; and **N. B. Ingram,** assistant general sales manager for Mid-Continent, named general sales manager.

R. T. Malin and **J. F. McCanne** have been promoted to chief process engineers from assistant chief process engineers at Magnolia Petroleum Co.'s Beaumont refinery. Malin will be in charge of the process control laboratory. McCanne will head the plant testing section. **R. E. Woodman** has been promoted from supervisory process engineer to assistant chief process engineer and will serve as McCanne's assistant. **R. M. Huff** and **C. W. Rackley** have been promoted from process engineers to supervisory process engineers.

PERSONALS

Huff is a member of the light oil process control section and Rackley of the lubricating oil process section of the process control laboratory.

J. A. Armstrong, assistant division exploration manager for Imperial Oil, Ltd., in Calgary, has been named assistant regional manager of the firm's western producing operations.

B. W. Beebee has been elected vice president in charge of production of Keating Drilling Co., Tulsa. Beebee began his petroleum career with Shell Oil Co. in 1935 as a geologist at Wichita. In 1938 he joined British-American Producing Co. as a division geologist. He organized the exploration department of Bay Petroleum Corp., Denver, in 1942. He moved to Oklahoma City in 1948 as exploration manager of Anderson-Prichard Oil Corp. and in 1950 he joined in forming Manhart, Millison & Beebee, exploration consultants and oil operators.

A. H. Massad has been promoted by Magnolia Petroleum Co. from assistant division petroleum engineer at Houston to division petroleum engineer of the Louisiana-Gulf division at Morgan City, La. **Byron O. Sims, Jr.,** has been promoted from petroleum engineer at Brownfield, Tex., to district petroleum engineer of the Natchez, Miss., district. **Norvan E. Bourland,** petroleum engineer at Alice, Tex., has been promoted to district petroleum engineer at Wewoka, Okla. Other producing department personnel changes include: **Robert E. Ritchie,** transferred from the Rodessa to the Brownfield district as petroleum engineer; **Doyle G. Marrs** from Drumright, Okla., to the Vanderbilt, Tex., district and **James H. Berry, Jr.,** from Vanderbilt to Drumright, both are petroleum engineers; **LeRoy Radford,** from Drumright to Midland, Tex., as petroleum engineer; **Marshall C. Culledge, Jr.,** from Brownfield to Midland as petroleum engineer; **Luther W. Randerson,** from Midland to Houston as senior petroleum engineer; **Glen W. Barb** from Wewoka to Vanderbilt as petroleum engineer; **John D. Howard,** from Vanderbilt to Falfurrias, Tex., as district petroleum engineer, replacing **J. L. White, Jr.,** who becomes production foreman at Falfurrias; and **Charles F. Underriner,** from Natchez to Electra, Tex., as district petroleum engineer.

S. J. Fisher has been promoted to senior petroleum engineer for Mountain Fuel Supply Co. at Rock Springs, Wyo. He is a graduate of Colorado School of Mines.

Hugh W. Curfman, former assistant regional geologist for Sun Oil Co., has been named district geologist at Lafayette, La., for Southern Production Co., Inc. Curfman had been with Sun for 7 years.

Howard E. Itten of Empire Geophysical Co. has been elected president of the Fort Worth Geophysical Society. Other new officers are: **Richard Brewer,** Continental Geophysical Co., vice president, and **Carl Wert,** Gulf Oil Corp., secretary-treasurer.

Everett A. Jenkins has been promoted to executive vice president by Three States Natural Gas Co., Dallas. Jenkins had been serving as vice president in charge of exploration and development. Before joining Three States last year, he had served 28 years with Skelly Oil Co.

William W. Henry has been named president of the Corpus Christi Geological Society for the 1955-56 term. Other officers elected are **Holland H. Mondy,** first vice president; **Wilford L. Stapp,** second vice president; **Mary W. Payne,** secretary; **William H. Spencer,** treasurer; and **Gaston H. Parrish** and **William G. Barfield,** councilors.

R. E. BRIDGES

R. E. Bridges, former Gulf Coast division superintendent of Humble Oil & Refining Co.'s production department, has been promoted to assistant manager of the department. He replaces **Bowman Thomas,** who resigned to enter private business. Bridges joined Humble in 1923.

Willard F. Jones, vice president and general manager of the marine department of Gulf Oil Corp., has retired from the company after 52 years of service, the longest any employe has served with the company. He began his career in 1903 as a deck boy on the "Northeastern," a tanker under charter to the J. M. Guffey Petroleum Co., the predecessor of Gulf. He held various positions in the marine department of the company until he was promoted to vice president in 1949. **Carl F. Vander Clute,** who joined Gulf in 1939, has been named to succeed Jones.

L. K. (Ken) Lancaster has been named manager of exploration for Edwin B. Cox & Edwin L. Cox, Dallas. Lancaster had been serving as division geologist for the central division of Tide Water Associated Oil Co. in Tulsa. He has had 20 years experience in the Gulf Coast, Mid-Continent, West Texas, and Rocky Mountain areas.

C. F. Blankenhorn, with Shell Oil Co. in its Houston offices, has been promoted to reservoir engineer and transferred to the company's Denver offices.

Warren W. Mankin, Jr., has resigned from the engineering staff of The Texas Co. at Fort Worth to take an engineering job with the New Mexico Oil Conservation Commission at Santa Fe. Mankin joined Texaco in early 1946 as a petroleum engineer at Wichita Falls, Tex. He has been at Fort Worth since 1950.

F. G. White, formerly district superintendent of Magnolia Pipeline Co.'s North Basin district at Brownfield, Tex., has been promoted to assistant superintendent of the company's northern division at Oklahoma City. **A. W. Butler** has been moved up from assistant district superintendent to district superintendent at Brownfield to replace White. **J. R. Dean** has been promoted from assistant of the Houston-Beaumont district superintendent to superintendent of the North Texas district at Wichita Falls, Tex. Other Magnolia pipeline changes include: **R. L. Phillips,** transferred from Snyder in West Texas district to Brownfield in North Basin district as assistant superintendent replacing Butler; **M. E. Bay,** from Wichita Falls in North Texas district to Corsicana in Dallas district as superintendent; **W. M. Harris,** from Corsicana to Snyder as assistant district superintendent; **Clyde R. Smith,** from gager foreman at Snyder to chief gager of western division at Midland; **A. G. Schwarz,** chief delivery gager at Midland to gager foreman at Sweetwater, Tex.; **R. L. Smith,** from gager foreman at Sweetwater to Snyder in the same capacity; and **John R. Whorton,** field gager at Brownfield to chief delivery gager at Midland.

PERSONALS

Wayland V. Jordan, production engineer with Continental Oil Co., has been transferred to a field office in Big Spring, Tex., from the Fort Worth offices.

R. V. Lahr has been named head of the newly created field operations department of Shell Pipe Line Corp. Lahr, a veteran of 22 years with Shell Pipe Line, has served in all the areas in which the company operates.

H. W. (Hank) Harding, former district petroleum engineer with Superior Oil Co. at Sinton, Tex., has resigned to accept a position as petroleum engineer for Mills Bennett Estate at Falfurrias, Tex.

Robert K. James, senior petroleum engineer for Magnolia Petroleum Co. at Houston, and **H. G. Walker,** petroleum engineer at Alice, Tex., are being transferred to Socony Mobil Oil Co., Inc., and will be assigned duties with the Iranian Consortium.

S. A. Womack, Jr., has been appointed geologist for Trans-Tex Drilling Co., Shreveport. Womack, who will be in charge of the geological department of Trans-Tex, had been a geologist since 1940 with Union Producing Co., Shreveport.

John W. Proctor, Calgary, has been appointed general manager of the Canadian Petroleum Association. Proctor succeeds **R. H. C. Harrison,** Q.C., president of the organization since 1951. The title of the association's top job was recently changed from president to general manager.

M. T. Buford, former field engineer with Refinery Engineering Co., Tulsa, has been named plant engineer for the recently completed refinery at Baghdad, Iraq, of the Government Oil Refineries Administration. Buford, a 1930 graduate of the University of Arkansas, served with Continental Oil Co. and Phillips Petroleum Co. before joining Refinery Engineering.

Ray W. Stewart has been loaned to Socony Mobil Oil Co., Inc., by Magnolia Pipeline Co. He was serving at Midland, Tex., as district superintendent in West Texas. He will serve Socony as pipeline operating engineer in Iran. Stewart will supervise operations and maintenance of the main crude-oil pipeline system from Iranian oil fields to the Abadan refinery and the Mashur loading terminal as well as certain pump stations. **L. A. Foy,** former chief gager of the western division at Midland, will replace Stewart at Midland.

A. O. Spaulding, formerly in Shell Oil Co.'s technical service division at Houston, has been transferred to Ventura, Calif., as a development engineer. **B. J. Barnes,** formerly at Salt Lake City, has been transferred to Los Angeles as a petroleum engineer.

John A. Poulin, former foreign production specialist in the Oil and Gas Division of the Interior Department, has been named executive assistant to **E. L. Steiniger,** vice president of Sinclair Oil Corp.

William E. Kammerer has been promoted to supervisor of operations of Tide Water Associated Oil Co.'s western marine department. Kammerer has been with Tide Water since 1920.

C. E. McCreight, former manager of Cooke Drilling Co.'s geological and land department at Fort Worth, has opened consulting offices in Dallas in association with **James M. Johnston,** geological and engineering consultant.

James A. Waters, who recently was retired as chief paleontologist for Sun Oil Co. after 30 years' service with the company, has joined Smith & Breyer, Corsicana, Tex., drilling contractor and oil operator, as paleontologist and geologist of the firm. Waters is a former president of the Society of Economic Paleontologists and Mineralogists and of the Cushman Foundation for Foraminiferal Research.

Marion E. Dice has been appointed assistant to the president of General Petroleum Corp. Dice had been serving as manager of the economics department since 1944. **W. F. Kirk** has been named to succeed Dice as manager of economics.

DEATHS

Patillo Higgins, 92, whose persistence resulted in the discovery of Spindletop field 54 years ago, died June 5 at his home in San Antonio. Higgins, a promotor and real-estate operator, was convinced oil would be found under "the hill" near Beaumont. He formed a company which drilled three tests, all abandoned because of mechanical failure before reaching target depth. He interested Anthony F. Lucas in the project, but by the time Lucas' gusher came in, Higgins had no interest in the well. He later sold his land surrounding the well for $3,000,000. He is credited with the later discoveries of Goose Creek field and Barbers' Hill.

R. W. (Dick) Burnett, 58, independent operator and colorful president of the Dallas Eagles baseball club of the Texas League, died recently in Shreveport after suffering a heart attack. Burnett was widely known throughout the petroleum industry and baseball.

Allen B. Harwood, 46, independent operator, died in Denver recently. A former employe of Sinclair Oil & Gas Co., he had been in Denver about 4 years.

Charles Frederick Stephenson, 56, division superintendent for Oklahoma and part of North Texas for Magnolia Petroleum Co., died June 6 in Temple, Tex. He had been with Magnolia 27 years.

Lindsay Hanna, 65, retired vice president and director of Standard Oil Co. of California, died recently in San Francisco after an extended illness. Hanna retired from Standard of California in 1948 after 37 years of service with the company. He joined the company in 1911 and later became superintendent of its El Segundo, Calif., refinery. He was named to the board of directors in 1940 and elected a vice president in 1941.

Edward F. Walsh, retired Bartlesville, Okla., oil man, died in a Tulsa hospital recently after a 6-week illness. Walsh, a resident of Bartlesville since 1906, was formerly president of Walsh Oil Co.

Joseph Dunbar, 58, president of the American Association of Oil Well Drilling Contractors and Dunbar Drilling Co., died June 5 at his home in Denver while mowing the lawn. Death was attributed to a heart attack.

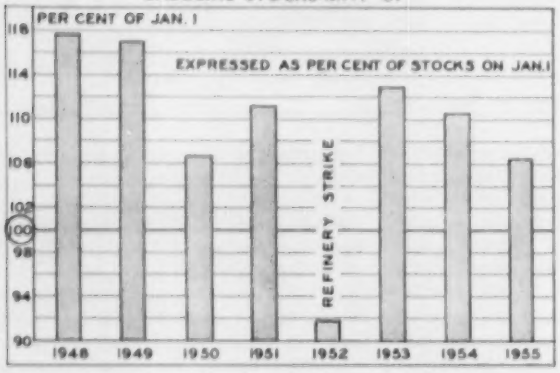
John L. Coulter, 65, former president of the International Oil Workers Union, died June 5 in Fort Worth. Coulter was president of the union from 1939-42.

Latest Figures . . . Industry Trends

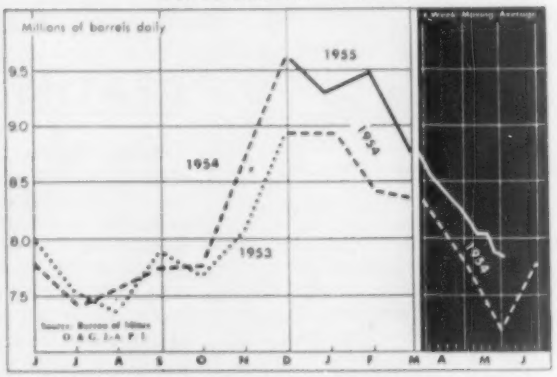
A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,601,225	DOWN	65,100	UP	112,230
Crude stocks	281,912,000	UP	2,894,000	UP	2,656,000
Completions	1,079	DOWN	112	UP	94
Refinery runs	7,565,000	UP	82,000	UP	421,000
Gasoline stocks	168,985,000	DOWN	388,000	DOWN	4,750,000
Distillate stocks	84,345,000	UP	4,141,000	UP	9,588,000
Four-product stocks	324,033,000	UP	5,080,000	UP	4,480,000
Total imports	1,074,800	DOWN	310,100	DOWN	70,500

GASOLINE STOCKS: MAY 31



TOTAL DEMAND – ALL OILS



Stock Comparisons Point to Good Gasoline Markets This Summer, But

THE percentage gain in gasoline stocks from the first of the year to the end of May was smaller this year than in any other normal year since the end of the war. Conditions were abnormal in 1952 because of the refinery strike.

Gasoline stocks at the end of May amounted to about 169,000,000 bbl., based on current weekly A.P.I. reports. Compared with 155,400,000 bbl. at the start of the year, the gain was about 8.4 per cent. End-of-May stocks last year were up 12.5 per cent from the first of the year, and the gain for the same period in 1953 was 14.9 per cent.

Gasoline stocks at the first of this year were about 2,500,000 bbl. less than a year earlier, and additions to inventories so far this year have been about 6,500,000 bbl. less. Stock changes are based on Bureau of Mines figures except for the estimate of current stocks from weekly A.P.I. reports.

Stock comparisons with last year seem to point to better gasoline markets during the coming season, but in making these comparisons suppliers should consider the fact that last year's conditions produced very soft markets. Here's what happened last year.

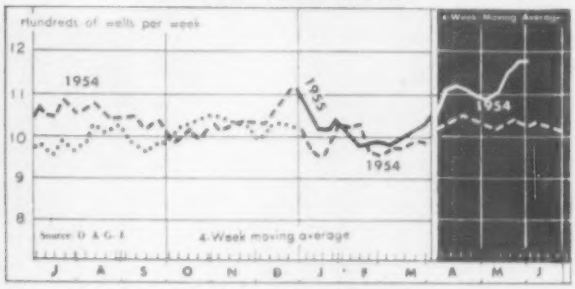
Gasoline stocks were high at the start of the year. Gasoline inventories increased 23,400,000 bbl. in the first quarter. Refinery runs averaged better than 7,000,000 bbl. daily in May, enough to produce a small increase in gasoline stocks when stocks should have dropped about 8,000,000 bbl.

Excessive inventories and soft markets forced sharp cuts in refinery runs. Refinery throughput for each month from June through November averaged less than for the corresponding month in 1953.

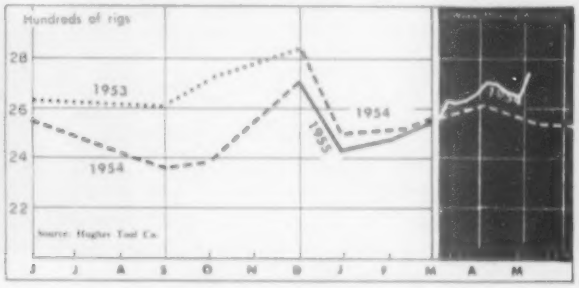
Gasoline markets were firming this year at the end of May, but the trend in refinery runs indicated a need for another look at the gasoline supply-demand balance. Runs increased 422,000 bbl. daily in the last 2 weeks of May. Gasoline stocks decreased only 1,760,000 bbl. during the 2-week period compared with a reduction of 5,100,000 bbl. for the corresponding weeks of April.

The cut in refinery runs in June last year reduced gasoline stocks by 12,000,000 bbl. Markets will remain firm this year if the June stock reduction averages about 2,000,000 bbl. per week.

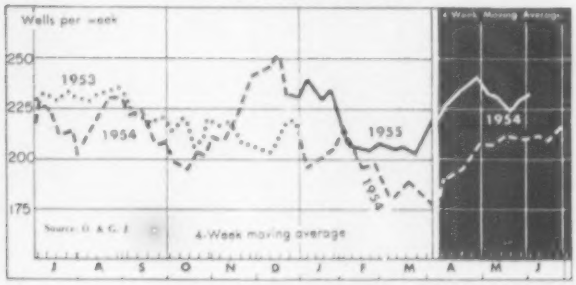
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	6-6-55	Change from 5-30-55	Change from 6-7-54
Gulf Coast	602	35	19
N. and W. Texas-New Mexico	886	14	97
Arkansas-N. Louisiana-E. Texas	175	5	4
Oklahoma	342	44	9
Kansas-S. Nebraska	176	—5	15
Illinois-Eastern	163	—10	19
Rocky Mountain	256	12	4
Pacific Coast	150	9	17
Total United States	2,750	104	184
Western Canada	158	30	32

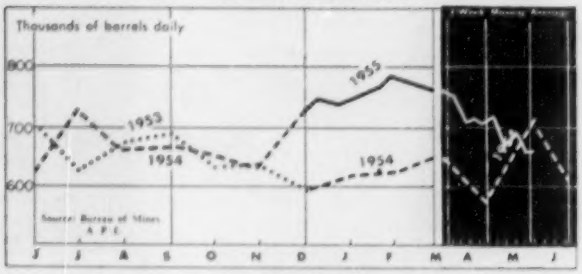
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 4, 1955

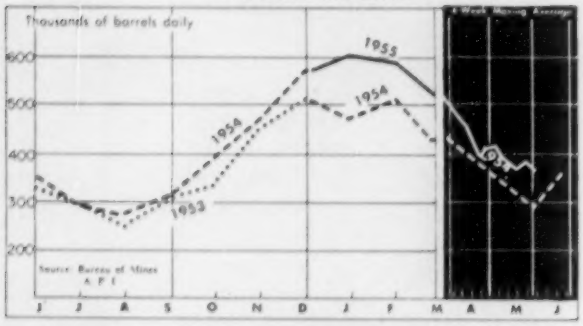
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	0	0	1	12,630	39	46	0	0	0	1	1	0	0	0	37	37
Arkansas	23	12	1	10	71,713	310	247	0	0	1	5	6	16	0	1	77	94
California	48	32	4	12	251,794	1,100	1,060	1	0	2	8	11	18	0	5	170	193
Colorado	24	7	0	17	131,141	573	541	0	0	0	15	15	21	0	14	285	320
Illinois	67	39	0	28	161,999	1,509	1,145	1	0	0	10	11	27	0	1	230	258
Indiana	14	3	0	11	24,570	322	354	0	0	0	5	5	7	0	0	148	155
Kansas	98	42	7	49	341,393	2,167	1,863	3	0	0	23	26	59	1	17	331	408
Kentucky	30	9	5	16	53,698	528	462	2	0	0	5	7	18	0	5	82	105
Louisiana	102	67	10	25	608,573	1,710	1,356	5	1	1	10	17	52	38	12	169	271
North	62	41	8	13	190,646	919	702	0	0	0	5	5	9	3	1	67	80
South	40	26	2	*12	417,927	791	654	5	1	1	5	12	43	35	11	102	191
Michigan	8	5	0	3	19,590	213	234	0	0	0	2	2	6	0	0	80	86
Mississippi	7	3	0	4	44,878	203	158	1	0	0	3	4	5	0	0	73	78
Montana	3	2	0	1	23,437	134	109	0	0	0	1	1	2	0	1	37	40
Nebraska	12	5	0	7	70,467	292	140	0	0	0	6	6	16	0	0	115	131
New Mexico	31	17	9	5	114,284	612	458	0	0	0	3	3	16	1	4	45	66
Northwest	10	0	8	2	28,523	170	134	0	0	0	2	2	2	0	4	14	20
Southeast	21	17	1	3	85,761	442	324	0	0	0	1	1	14	1	0	31	46
North Dakota	2	1	0	1	14,985	94	104	0	0	0	1	1	0	0	0	15	15
Ohio	19	11	3	5	42,104	458	487	0	0	0	0	0	1	0	2	12	15
Oklahoma	151	98	8	†45	476,927	3,652	3,900	2	0	0	14	16	55	7	16	276	354
Pennsylvania-New York	29	12	5	‡12	53,509	711	1,040	0	0	0	0	0	0	0	5	3	8
Texas	388	237	7	144	1,676,043	8,309	7,617	11	2	1	75	89	313	48	58	1,707	2,126
Southwest (1 & 4)	72	41	1	30	264,302	1,307	1,072	4	2	0	18	24	42	13	19	330	404
Gulf Coast (2 & 3)	45	24	0	21	282,609	1,092	1,107	1	0	0	12	13	37	28	21	272	358
East (5 & 6)	23	8	3	12	121,964	408	408	0	0	1	11	12	12	3	2	131	148
North Central (7-B & 9)	139	76	0	63	419,043	2,986	2,903	5	0	0	24	29	158	0	4	659	821
West (7-C & 8)	91	76	1	14	522,681	2,091	1,735	1	0	0	8	9	61	1	6	303	371
Panhandle (10)	18	12	2	4	65,444	425	392	0	0	0	2	2	3	3	6	12	24
Utah	0	0	0	0	0	28	28	0	0	0	0	0	2	0	2	16	20
West Virginia	16	1	13	2	43,471	254	224	0	0	0	0	0	0	0	6	10	16
Wyoming	6	0	1	5	32,026	328	585	0	0	0	3	3	8	0	3	68	79
Miscellaneous	0	0	0	0	0	15	76	0	0	0	0	0	0	0	0	12	12
Total United States	**1,079**	603	73	403	4,269,232	23,561	22,234	26	3	5	190	**224**	642	95	152	3,998	4,887
Total previous week	1,191	666	62	463	4,647,895			32	4	8	217	261	616	92	147	3,808	4,663
Total June 5, 1954	985	552	64	369	4,063,193			34	2	7	166	209	604	64	142	3,686	4,496
Western Canada	51	37	2	*12	232,754												

Service wells included: *2, 14, 110.

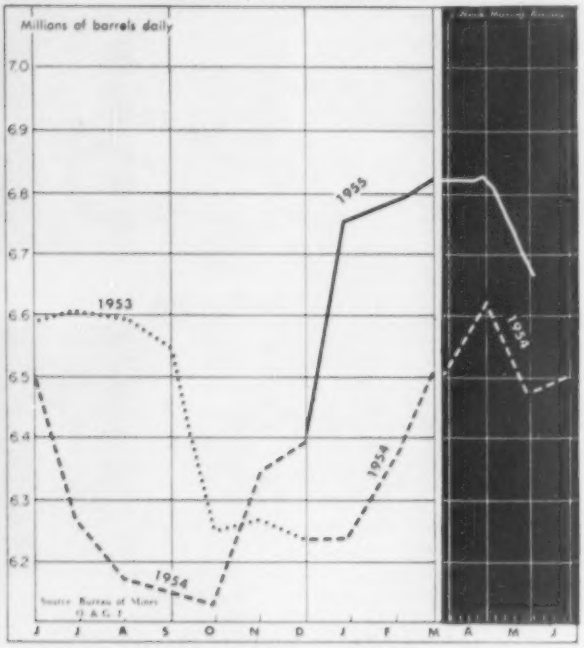
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE OIL PRODUCTION

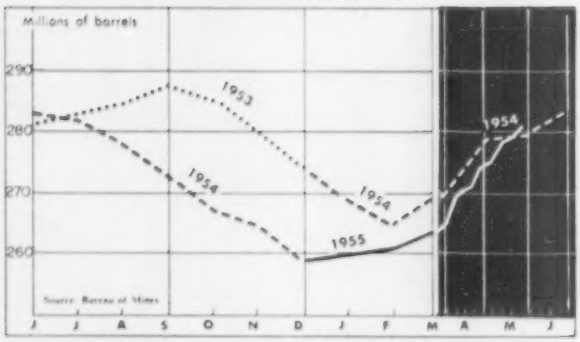


DAILY AVERAGE PRODUCTION FOR WEEK

	June 4			May 28
	Crude oil	Lease condensate	Total	total
Alabama	3,600		3,600	3,700
Arkansas	73,250	550	73,800	74,050
California	975,200		975,200	975,800
Colorado	141,600		141,600	144,400
Eastern	46,500		46,500	46,500
Florida	1,325		1,325	1,350
Illinois	228,500		228,500	220,100
Indiana	28,600		28,600	28,800
Kansas	297,800		297,800	309,100
Kentucky	40,300		40,300	40,200
Louisiana	650,800	47,800	698,600	729,700
North	112,500	2,800	115,300	115,700
South	538,300	45,000	583,300	614,000
Michigan	32,300		32,300	29,700
Mississippi	92,900	4,150	97,050	96,675
Montana	45,500		45,500	45,100
Nebraska	29,400		29,400	30,100
New Mexico	225,300	3,530	228,850	231,850
North Dakota	22,300		22,300	24,700
Oklahoma	524,300		524,300	533,100
Texas	2,749,075	47,325	2,796,400	2,811,300
Dist. 1	53,350	550	53,900	54,200
Dist. 2	138,425	7,500	145,925	147,900
Dist. 3	424,425	21,500	445,925	449,800
Dist. 4	231,775	5,200	236,975	237,975
Dist. 5	45,500	400	45,900	45,975
Dist. 6	117,050	4,800	121,850	123,450
East Texas field	210,550		210,550	213,000
Dist. 7-B	139,850	50	139,900	139,050
Dist. 7-C	184,375	4,600	188,975	189,750
Dist. 8	909,875	2,100	911,975	914,800
Dist. 9	205,975	500	206,475	207,775
Dist. 10	87,925	125	88,050	87,625
Utah	5,800		5,800	6,000
Wyoming	283,200		283,200	283,800
Others	‡300		‡300	300
Total U.S.	6,497,850	103,375	**6,601,225**	6,666,325
Change from prev. week, down			**65,100**	
Canada	†295,675		†295,675	†348,475
Total U.S. production January 1-June 4				1,045,326,750
Same period last year (crude plus cond.)				*998,797,475

*Includes 16,000,525 bbl. condensate. †Week ended previous Monday. ‡S.D. 100, Nev. 200.

CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

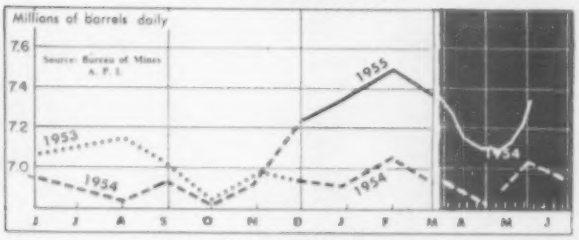
(Thousands of barrels)

	May 28, '55	May 21, '55	May 29, '54
Pennsylvania Grade	2,863	2,873	3,237
Other Appalachian	2,158	2,091	1,849
Illinois, Indiana, Michigan	13,353	12,996	12,655
Nebraska, North Dakota	2,678	2,336	(‡)
Kansas	8,685	8,826	10,144
Oklahoma	25,593	24,836	28,687
Arkansas	3,043	2,922	3,185
Louisiana	16,447	16,731	16,257
North	2,742	2,654	2,459
South	13,705	14,077	13,798
Mississippi	2,927	2,887	3,177
New Mexico	8,822	8,923	7,222
Texas	128,809	128,631	128,068
East Texas proper	9,953	10,258	12,163
West Texas	58,082	56,410	54,857
Texas Gulf	26,410	26,360	27,863
Other Texas	34,364	35,603	33,185
Wyoming	15,906	15,732	14,282
Other Rocky Mountain	5,162	5,340	4,082
California	31,979	31,683	33,039
Foreign	†13,487	12,211	13,372
Total	281,912	279,018	279,256

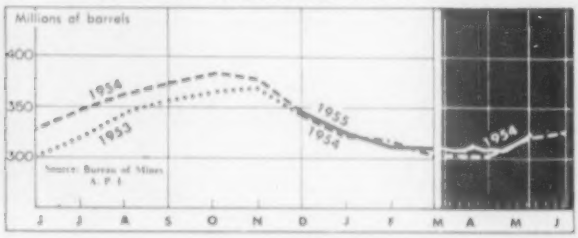
*Bureau of Mines. †Includes 2,713,000 bbl. in California. ‡Included with Kansas.

CURRENT DATA ON RUNS AND PRODUCTION ARE 4-WEEK AVERAGES

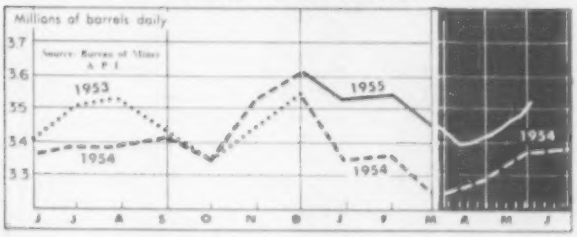
REFINERY RUNS



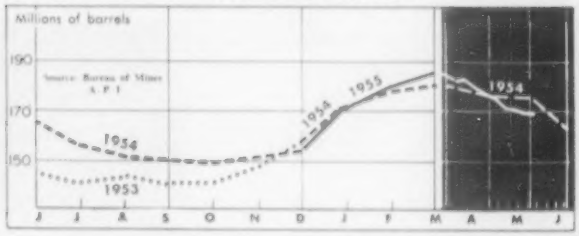
FOUR-PRODUCT STOCKS



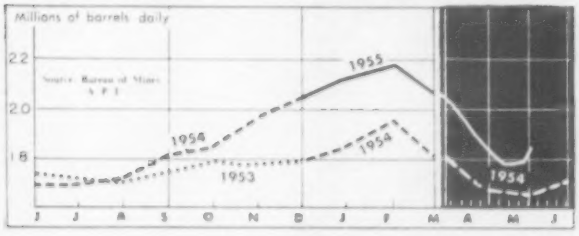
GASOLINE PRODUCTION



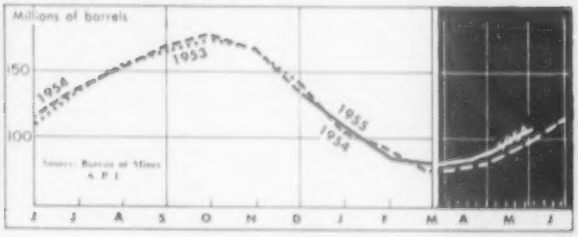
GASOLINE STOCKS



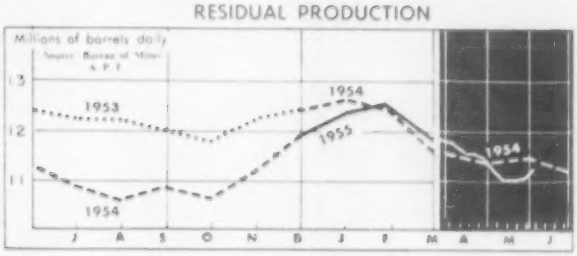
MIDDLE-DISTILLATE PRODUCTION



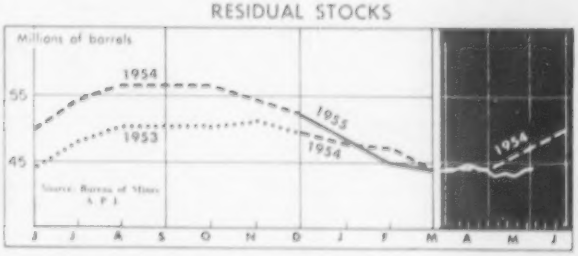
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JUNE 3

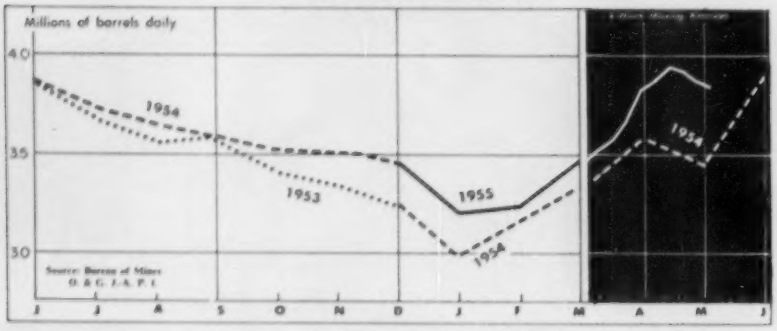
(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, June 1954—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,149	417.2	37.7	283.8	195.9	37,746	10,985	28,202	8,967	1,031	429.3	31.4	230.1	187.5
Appalachian:														
District 1	76	28.6	2.3	17.3	3.7	4,741	468	1,702	299	108	47.2	3.5	23.9	8.5
District 2	102	51.0	8.6	12.8	12.4	2,310	377	683	259	93	52.8	3.5	10.2	10.7
Ind., Ill., Ky.	1,412	702.7	63.0	262.6	163.0	34,952	6,109	15,908	4,044	1,273	675.1	67.4	234.2	154.4
Okla., Kans., Mo.	666	373.1	21.9	156.7	37.3	16,174	1,416	9,470	842	615	350.6	19.7	132.4	43.8
Inland Texas	252	188.3	11.3	44.3	24.1	6,414	414	1,501	1,289	243	173.4	8.6	44.2	23.7
Texas Gulf Coast	1,825	852.4	108.7	466.6	232.4	23,129	3,230	9,534	4,281	1,630	779.9	103.5	357.5	220.2
La. Gulf Coast	638	322.0	29.4	193.3	44.3	10,351	1,893	4,664	1,433	565	268.1	51.3	143.0	46.4
N. La. and Ark.	88	33.1	8.4	18.8	5.4	3,787	924	1,550	76	89	36.0	7.4	19.7	6.5
Rocky Mountain:														
New Mexico	21	12.0	1.0	3.0	2.7	221		86	29	20	11.7	0.2	3.7	2.6
Other Rocky Mtn.	250	115.9	3.0	61.3	38.9	7,352	214	2,116	792	256	126.6	3.8	56.1	36.6
California	1,086	471.3	13.1	170.6	367.6	21,808	314	8,929	22,048	1,024	428.6	5.6	143.9	382.1
June 3, 1955	7,565	3,567.6	308.4	1,691.1	1,127.7	168,985	26,344	84,345	44,359	6,947	3,379.3	305.9	1,398.9	1,123.0
May 27, 1955	7,483	3,524.1	313.7	1,534.0	1,152.9	169,373	25,220	80,204	44,156					
June 4, 1954	7,144	3,451.4	276.1	1,403.6	1,161.1	173,735	24,559	74,757	46,502					

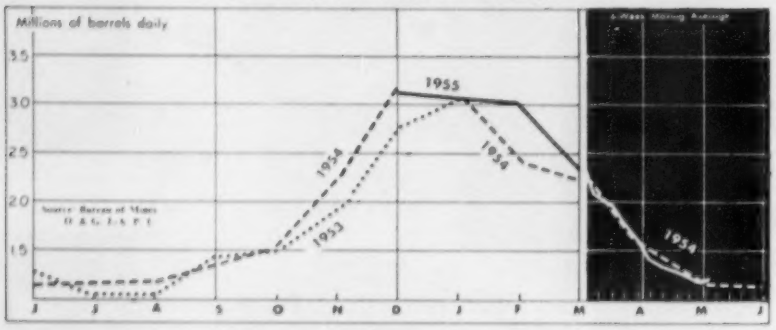
*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

CURRENT STATISTICS — DEMAND

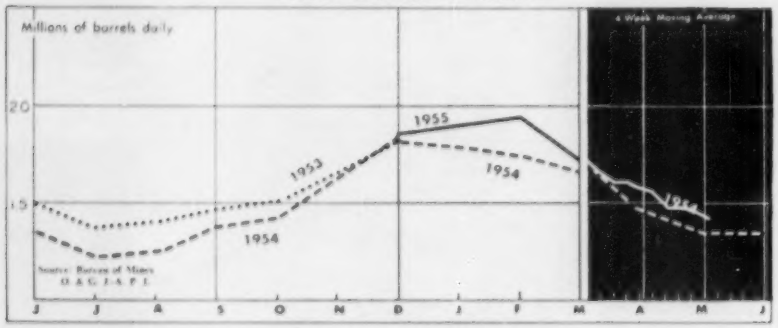
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of June 8, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.75-11.25	11.25-12	10.25-10.75
Premium gasoline	12-12.5	13-13.75	11.50-12
42-44 w.w. kerosine	9.375-9.625	10.05	8.5-8.75
No. 2 straw fuel oil	8.625-8.875	9.3	8.0-8.25
No. 6 residual	$1.70-1.80	$2.35-2.45	$2.00-2.05

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4.5	4.0	4.25
Grade 18-55	5.4	4.9	5.15

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Residual fuel is still stronger than any other major product on all markets east of California. Some suppliers are predicting a repeat of last year's pattern in which resid prices were firmer during the summer months than at the start of the winter season. Gulf Coast gasoline is improving, but regular grade is still readily available.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 6-3-55	3,522	3,826
March 1955	3,460	3,408
April 1954	3,298	3,547
May 1954	3,377	3,463
Middle distillate:		
Four weeks ended 6-3-55	1,849	1,220
March 1955	2,060	2,297
April 1954	1,696	1,592
May 1954	1,674	1,167
Residual fuel:		
Four weeks ended 6-3-55	1,126	1,435
March 1955	1,185	1,749
April 1954	1,141	1,479
May 1954	1,148	1,342

CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, January 21, 1955.

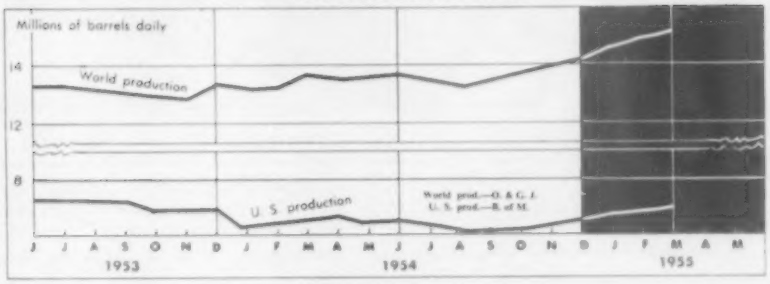
FLAT CRUDE PRICES

Representative posted schedules per barrel.

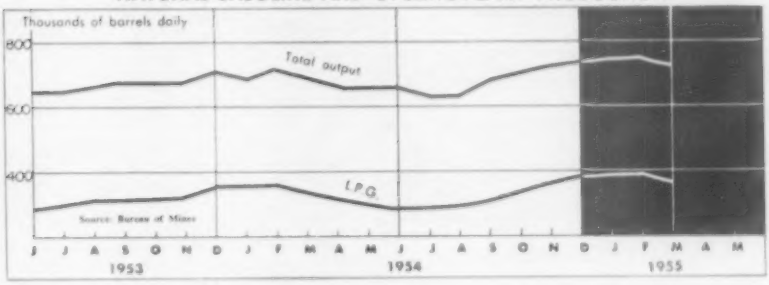
Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.50
Middle District	3.37
Southwest Pennsylvania	3.08
West Virginia	2.97
Buckeye Grade	2.91
Zanesville Grade	2.72
Illinois Basin	2.90

CURRENT STATISTICS — SELECTED MONTHLY DATA

CRUDE OIL PRODUCTION


Millions of barrels daily
14
12
8
World production
U. S. production
World prod.—O. & G. J.
U. S. prod.—B. of M.
J J A S O N D J F M A M J J A S O N D J F M A M
1953
1954
1955

NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



PRODUCTION AT NATURAL-GASOLINE AND CYCLING PLANTS

(Thousands of barrels daily)

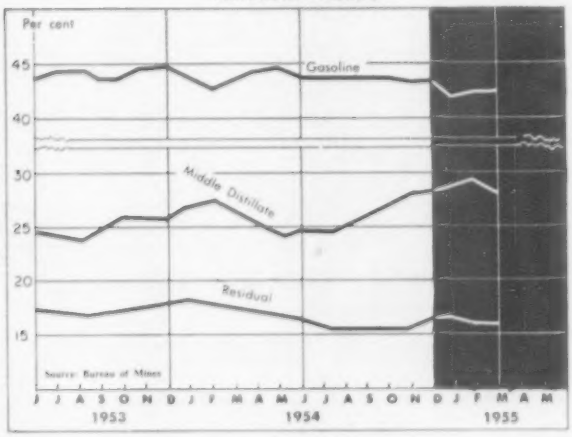
Month—	L.P.G.	Total
March 1955	361	720
February 1955	390	751
January 1955	387	746
July 1954	286	642
March 1954	332	692

CRUDE PRODUCTION

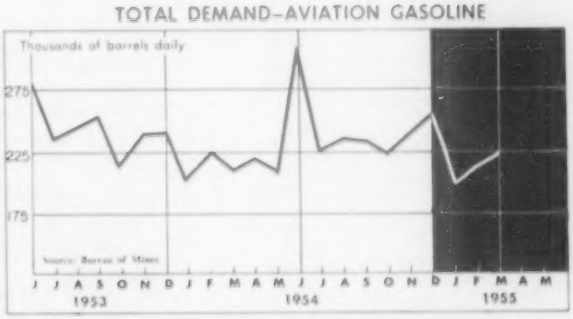
(Thousands of barrels daily)

Month—	U.S.	World
March 1955	6,886	15,123
February 1955	6,835	14,943
January 1955	6,761	14,633
July 1954	6,259	13,528
March 1954	6,507	13,664

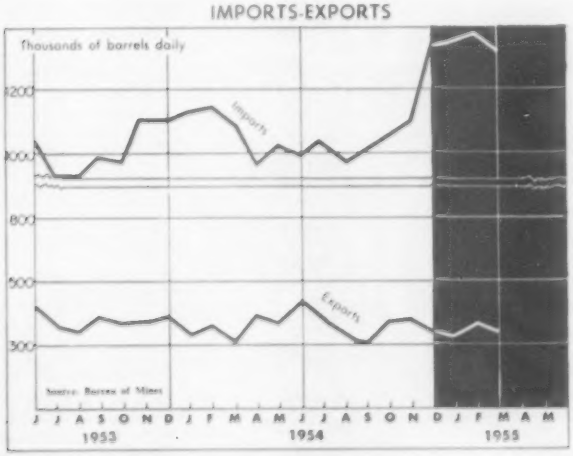
REFINERY YIELDS



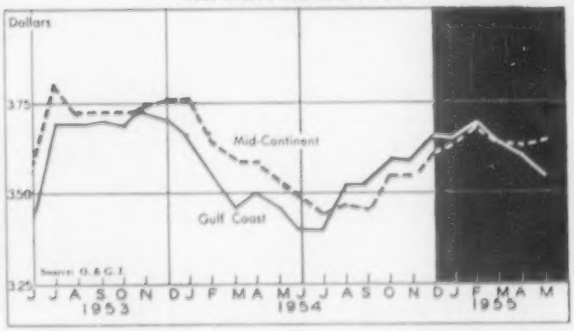
TOTAL DEMAND–AVIATION GASOLINE



IMPORTS-EXPORTS



REFINERY REALIZATION



REFINERY REALIZATION

	May* 1955	Apr.* 1955	Mar. 1955	May 1954
Mid-Continent	$3.66	$3.63	$3.64	$3.59
Gulf Coast	3.55	3.60	3.64	3.47

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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FOR SALE EQUIPMENT

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa. Phone 4-9700.

2—200 H.P. CLARK direct driven compressors less compressor cylinders $2000.00 each. 1 Do with 8½" and 10" compressor cylinders $3250.00. Located near Kilgore, Texas. Nolan Sales Corp. Tulsa, Okla.

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100#-250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 850# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY EQUIPMENT

BOILERS: 200 H.P. 200 lb. W.P. Water tube with fittings—$3000.00; Three 80 H.P.—H.R.T.—150 lb. $500.00 each; Oilfield Type 100 H.P. 150 lb.—$500.00.
TOWERS: Fractionater 48"x74', price $1500.00; Fractionater 48"x24', price $1000.00; Vacuum Tower 48"x24', price $750.00.
HEATERS: Two 5000 bbl. per day, 7,500,000 B.T.U. crude oil, price $1500.00 each.
TANKS: 1000 bbl. Agitator, price $1500.00. Accumulators of various sizes—$50.00 each.
STILL TUBES: 4" Sched. 80—1¼% cr. ½ M—Spec. A-335; WP-11—50 pcs. New. 20' long, price $381.83 CFT.

ROTHSCHILD OIL COMPANY
12354 Lakeland Road
Santa Fe Springs, California
RAymond 3-3387

USED EQUIPMENT

#527—Franks Model 44-TM, Single Drum, Truck Mounted Servicing Unit, 8x10x50' Single Pole Mast, Mounted on FWD Truck.

#536—Franks Model E.T. Single Drum Servicing Unit, 8x10x62' Single Pole Mast, Mounted on 1941 R8-F International Truck.

#526—Franks Super Rast Texas Double Clutch, Single Drum, Mounted upon KS-11 International Truck. No Mast.

#541—Franks Model ET Single Drum with 8x10x62-ft. Mast, Mounted upon 1948 Model K8 International Truck.

#517—Type 3 O.C.S. Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

#525—50/60 Ideco Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.

#515—Cardwell KL Double Drum Spudder with 60 ft. derrick.

Write, Wire or Call

FRANKS MFG. CORPORATION
SUBSIDIARY OF CABOT SHOPS, INC.
BOX 3218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

FOR SALE—1—1600 bbls. and 1—1000 bbls. red wood National 3" stave tanks at a bargain located near Wichita Falls, Texas. 1110 City Natl. Bldg. Ph. 2-7889, Wichita Falls, Texas.

FOR SALE—Like new Propane Plant designed and constructed by J. F. Pritchard & Company, Kansas City, Missouri. Capacity —292,000 Cu. Ft. Propane Air. 1350 B.T.U. at 50 P.S.I. Discharge Pressure. Company has developed underground storage field which eliminates need for propane plant. Reply To: H. J. Bell, Southern Indiana Gas and Electric Company, Hulman Building, Evansville, Indiana.

LIQUIDATION

5—600 HP IR Type KVG Gas Engine Driven 2 Stage Compressors (1942).

1—660 HP IR Type KVG Gas Engine Driven 2 Stage Compressor (1952).

$50,000 New Spare Parts for Above.

2—IR Starting Air Compressors, Model 25c, Type 40, 265#, 67.6 cfm.

LIQUIDATION LEVELLAND, TEX.

TOWERS: 6'x50' chrome-lined (1951) 6'6"x65', 6'x27', 5'x27', 42"x49', 30"x38'.
HEAT EXCHANGERS: (2) 800 sq. ft. (675# 800° F.) Steel.
VESSELS: 3'10"x38', 325#, 950° F.; 5'3"x36'6" (90# 845° F.) chrome lined.
PUMPS: BJ5-St. ni.-chr. pump, 2100' hd., 400 gpm.; IR 15x7x14 steam driven comp.
MISCELL.: Steel, chrome, pipe, valves and fittings, etc. NEW.

AT OTHER LOCATIONS

10—1500, 1000, 430, 360 sq. ft. Steel Ht. Exchangers.
4—2400, 740, 470, 424 sq. ft. Adm. Ht. Exchangers.
6—325# Vessels 10'x35', 7'x30', 4'x40'.
3—150# Vessels, 10'x20', 8'x16', 6'x20'.
4—Centrifugal Pumps, 2000 gpm. 90' hd., 60 gpm. 460' hd., motor and turb. driven.

ATMOSPHERIC HEAT EXCHANGERS

8—715 sq. ft., 850 psig, 550° F., S.S.
6—470 sq. ft. 850 psig, 550° F., S.S.
13—715 sq. ft. 125 psig, 300° F. S.S.
6—715 sq. ft. Admiralty 125 psig, 300° F.

WIRE! 'PHONE! WRITE!

Full Details on Request

BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas, Locust 1351
Or
2401 Third Ave., New York 51, N. Y., Cypress 2-9703
"We buy from a single item to a complete plant"

FOR SALE EQUIPMENT

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted —max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-5050.

WILSON SUPER—Cleanest small rotary in Oklahoma. New 1953. Stands doubles. New drawworks engine. Nearly new 10" Gaso mud pump. 3000' good 3½" drill pipe. Complete every way. Drills to 3700 feet easily. Bargain $40,000.00. Box H-829, The Oil and Gas Journal, Tulsa, Oklahoma.

AIRCRAFT PARTS & REPAIRS

Mr. Aircraft Owner: Take advantage of our extra special service and vast inventories of Parts, ENGINES, PROPELLERS, TIRES and Supplies. Domestic and Foreign shipments. C A A approved repair station No. 3846.

VESTCO
Dept. L, Box 5306 T A
Denver 17, Colo.

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO.
P. O. Box 670, Ft. Worth, Texas

ATTENTION OIL INDUSTRY

(Operators, Producers and Drillers)
FOR SALE
$100,000.00 Inventory Drilling Tools
At 35% OFF
(All or Part)

REED CORE KINGS
Cutter Heads and Core Catchers
Sizes from 5⅞" to 8⅛" both Hard and Soft formations for K-500 to K-675 barrels, complete with K-30A 2 piece Core Catcher.

REED CUTTERS
(For Wire Line Coring)
Sizes from 7⅝" to 9⅞" both Hard and Soft formations, both Pin and Box connections for all type barrels.

H. C. SMITH, SECURITY AND REED ROLLER ROCK BITS
Sizes from 5⅞" to 9⅞", Soft, Medium and Hard formations. Includes some Jet Bits.
All materials guaranteed factory new, manufactured 1952. No leasing agreement required. Write for detailed list and prices.

B. E. Cowan & Associates
Box 378 Elizabethtown, Kentucky

FOR SALE EQUIPMENT

FOR SALE: 2—55 M bbl. fabricated shells with structures. 2—55 M bbl. dismantled not fabricated complete less bottoms. Can furnish new bottoms or roofs re-erected. S. Skeen Staley, Jr. 3530 Singleton Blvd., Phone ED-2-6643. Dallas.

BUCYRUS-ERIE Spudder—36 L. Buda engine, butane equipped. Auxiliary leg. Tools from 15½" to 5". Completely equipped and ready to drill. Inventory furnished upon request. Robert J. Orr, 1928 Crestview Dr., Bartlesville, Okla. Phone 5427.

FOR SALE OR DEAL

Three rebuilt Type 80 Cooper Gas Engine Driven Compressors. Cylinders to suit. Two as is. Compressor cylinders all sizes.

W. S. SMITH
205 Thompson Bldg., Tulsa, Okla.
Tel. 2-5473.

NEED A PIPE LINE

Have 800 Miles 8" Line Pipe

we are taking up through Illinois, Indiana, and Ohio. Will furnish pipe, go in on a deal, or finance.

We are open for any kind of deal.

REDNEB PIPE CO.

P. O. Box 1798 Shreveport, La.
Phone 2-3276

FOR SALE EQUIPMENT

GARDNER-DENVER FXD 7¼"x10" Mud Pump unitized with engine. Skid mounted. General Tool & Supply Co., Box 4387, Oklahoma City, Okla.

USED ROTARY EQUIPMENT. Complete rigs, three to ten thousand feet. Used engines, Cats, Murphys, General Motors, Waukeshas, Budas. Slush pumps, draw works (extra fine U-15), hooks, blocks, tables, etc. Write or call Ike Ridenhour, 1758 N. Bluff, Wichita, Kansas. Phone Murray 4-3596.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply, Tulsa.

THREE #12 Sweetland Filters, 48 bronze leaves, monel covered on 3" C.C., now located in southwest, available for inspection. 11 Sperry 18" x 18" cast iron Filter presses. 11 chambers. Consolidated Products Co. Inc. #65 Garden Street, Hoboken, N. J. N. Y. Tel.: BArclay 7-0600.

FOR SALE

1 Caterpillar generator, A.C., 15 K.W.
1 Century generator, D.C., 10 K.W.
1 General Electric generator, D.C., 10 K.W.
1 Westinghouse, D.C., 10 K.W., generator.
1 Kohler electric plant, D.C., 1½ K.W., 4 cylinder.
1 Kohler electric plant, D.C., 5 K.W., 4 cylinder.
1 Kohler electric plant, 5 K.W., Waukesha motor, F.C.-149.

All in excellent condition, may be seen at Makin Yard, Hobbs, New Mexico, or call 3-4062 or 3-3141.

MAKIN DRILLING COMPANY
P. O. BOX 1628
HOBBS, NEW MEXICO

FOR SALE EQUIPMENT

FAILING MODEL 55, truck mounted complete with drill pipe, trucks and necessary tools, now drilling irrigation wells. Write or call E. J. Mickle, 203 S. Ellison, Guymon, Okla., pho. 520.

MODEL S-33 Walker-Neer Spudder Serial #1485. NEW—Never been set up—Sell at discount. Write P. O. Box 127, Lovington, New Mexico. Phones 8533 or 3791.

PIPE SALE

Large quantity of used, standard line pipe for sale. Because material must be moved quickly, will sell at the following bargain prices: 2" @ 5c per foot; 3" @ 11c per foot; 4" @ 14c per foot; 8" @ 45c per foot. If interested, call, write, or wire to The Tri-State Pipe Company, Bellaire, Ohio, Telephone—42.

FOR SALE OR TRADE: Nearly new 2500 to 3000 ft. spudder, with tools, sheer poles and diesel motor, located in Oklahoma. Want spudder 1000 ft. capacity or large core drill. Failing preferred. Box 400, Great Bend, Kansas.

CORE DRILLS, SPUDDERS, ROTARIES: New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

CLEAVER-BROOKS Steam Generator Units; 3 (Only) 17,500 lbs. Hr. Each, 100 PSI, Automatic, Gas Fired. Excellent. Refinery Materials Company, Box 14306, Houston.

FOR SALE

6—30" I.D. GATE VALVES. Hydraul. Oper. 1—Solvent Reclaiming Plant, w. 2—10,000 gal. Stainless Steel Tanks. Excell. Cond. 10 tons welding electrodes, wire, Stainless, Bronze, Mild, Nickel, etc.

LESCO PRODUCTS
4205 Fullerton, Detroit 38.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

NEW PIPE

10¾" O.D. .203 wall 22.88 pound double random lengths—approx 20,000 feet.
26" O.D. .188 wall 40' lengths—approx. 1,000 feet.
30" O.D. .344 wall 40' lengths—approx. 600 feet.

RECONDITIONED BLACK PIPE

8⅝" O.D. .322 wall 28.55 pound 16' to 20' Random Lengths—Approx. 8,500 feet.
12¾" O.D. .375 wall 49.56 pound 16' to 20' Random Lengths—Approx. 12,500 feet.

IMMEDIATE DELIVERY **SUBJECT TO PRIOR SALE**
Phone — Write — Wire

BROWN-STRAUSS CORPORATION
1546 GUINOTTE PHONE HA 1000 KANSAS CITY, MO.

3750 BBL. PER DAY MODERN OIL REFINERY
LOCATED AT POCATELLO, IDAHO

FOR SALE COMPLETE—OR IN UNITS—OR PIECEMEAL
TO BE REMOVED FROM PRESENT SITE

- **PRODUCTS PRODUCED:** Motor Fuels—Burning Oils—Asphalt.
- **PROCESSES:** Crude Distillation and Cracking.
- **FURNACES:** Crude Oil—Aux. Superheater—Light Oil—Vacuum.
- **TOWERS:** Crude—Asphalt—Flash—Reactor—Scrubber—Cracking Bubble—Stabilizer—Naphtha—Fuel Oil Flash Low and High Pressure Absorbers and Accumulators.
- **AUXILIARY EQUIPMENT:** Heat Exchangers—Pumps—Engines—Compressors—Metering & Control Equipment—Piping Boiler Plant—Steel Buildings—(47) Welded Storage Tanks from 300 to 35,000 bbl. capacity.

TO BE SOLD AT A FRACTION OF ITS REPLACEMENT COST

FINANCING CAN BE ARRANGED

PHONE—WIRE—WRITE FOR COMPLETE INVENTORY

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60 EAST 42ND STREET MURRAY HILL 7-5280 NEW YORK 17, N. Y.
Machinery & Equipment Merchants

LIQUIDATION
All New Equipment

Fairbanks-Morse Engine Model 38F90
7—Heavy Duty Trailers
7,423 ft. 2⅞ O.D. Drill Pipe
Gardner-Denver Pumps and Compressor

As well as all other equipment for Hydraulic Drilling Rig. Will entertain bids on individual items or on the entire lot.

For complete details,
WIRE, PHONE or WRITE.

C. E. LETTS
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Detroit 16, Michigan
Phone: Tashmoo 5-0345

CHURCHILL

2D-4D-5D PUMPING UNITS
#303—#404 Core Barrels

BUY DIRECT FROM FACTORY AT WHOLESALE PRICES

#4D and #5D Units A.P.I. Approved

Write for literature & prices.

East Side Machine Works

CHANUTE, KANSAS

FOR SALE EQUIPMENT

FOR SALE: Medium and small rotary rigs ready to work, priced right for sale. For further information contact Box H-778, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Water pressure plant and Oil Well Pumping Power Equipment, including Clark, Bessemer and Reid Gas Engines, some convertible to Oil. Worthington, Clark and National Transit pressure pumps. National and Reid Bandwheel Powers, etc. For complete information, write QUAKER STATE OIL REFINING CORP., Box 237, Bradford, Penna.

FOR SALE—At Oil Hill, Kansas, 4—Cooper Type 80 Twin Engine Compressor Units, with 8½"x20" Class A and 15½"x20" Class C Compressor Cylinders. Also 1—Type 80 Single DO, with 6½" and 10½" x 20" Tandem Cylinders. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

ATTENTION: Oilmen—Mining Men—Core Drillers. Have Heavy-Duty Franks 2000 Rotary Drilling Unit, unitized on tandem wheels. This is rugged core-drill designed for fast and inexpensive drilling of core holes for oil & mining exploration, shallow oilwells or water wells. Unit has hydraulic raised, 26' strong four legged derrick, racking board, rotary table, blocks, hook, 5x8 mud pump, two HD Industrial Ford V-8 power units, all Unitized to move in one load. Also has automatic Pull-down for faster drilling near surface. This is a high class drilling unit for efficient and low-priced operation, and is ready to go. No drill pipe. Will sell for $17,750.00. Can be inspected at Wichtex Machinery Co., Wichita Falls, Texas or Write or call R. F. Hare, 2018 W. T. Waggoner Bldg., Ft. Worth—Ph. FA-4646.

FOR SALE: Office Desks, Chairs, Typewriter, Filing Cabinets, etc. H. M. Williams Drilling Company, 701 Bitting Building, Wichita, Kansas.

STAR 45 Spudder complete, and Waukesha motor, less tools, rig house, and lines; $3700; excellent condition, ready to drill, see R. S. Aggas on lease 1 mile east, ½ south Tyro, Kansas.

EQUIPMENT WANTED

WANTED good 7¼x14 slush pump. Give location and price. Box H-851, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED core drill in good condition, 600 or 1,000 Mayhew preferred. Give price, location, and make, size and age of truck. Box H-848, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED good used triple Lee C. Moore derrick. Give location, condition and price. Box H-849, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED 4000 to 5000 ft. power rig in good condition. Give location, description and price. Box H-850, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: One—Cooper-Bessemer GMX-4 Compressor, with high pressure cylinders. Box H-841, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

CHEMICAL ENGINEER with 6-8 years experience in process control, process design and economics to be in charge of Engineering Department in small Midwest Refinery. Reply should include resume of experience, education, references and salary expected. Box H-861, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

Manufacturers' Representative for South West Texas, Houston Gulf Coast, and So. Louisiana to sell production specialty equipment through Supply Stores. Reply kept confidential.

DROVIL COMPANY
P. O. BOX 58183
LOS ANGELES 58, CALIF.

HELP WANTED

WANTED—Experienced Seismic Party Chiefs, Seismologists and Chief Computers. Must have college degree. Excellent opportunity for advancement. Replies will be held in confidence. Box H-844, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Graduate electrical, civil or mechanical engineer for office and field work by major oil company in Middle West. Please state age, experience and educational qualifications. Box H-837, The Oil and Gas Journal, Tulsa, Oklahoma

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

FIELD SUPERINTENDENT: We have an opening for a Kansas district requiring supervision of 1000 bbl. daily production. Promising future. State age & qualifications. Strictly confidential. Write Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

IMMEDIATE OPENING for graduate engineer desiring sales work. Home office location, Tulsa, Oklahoma. Give complete resume of experience, references, and salary expected in first reply. Box H-803, The Oil and Gas Journal, Tulsa, Oklahoma.

MAINTENANCE AND CONSTRUCTION SUPERVISOR

for expanding independent refinery in Upper Midwest. 5 or more years refinery or process plant experience required. Challenging opportunity for qualified man. Write giving full particulars.

Box H-831, The Oil and Gas Journal, Tulsa, Oklahoma.

Chemical Engineer

Unusual Opportunity

Unusual opening with moderate size, well-established engineering firm for young chemical engineer preferably with major company or equivalent experience. Good educational background and four or more years experience with modern refinery processing and design and economic studies. Acquaintance with catalytic reforming and cracking desirable.

An ambitious and resourceful engineer will find this an outstanding opportunity for personal advancement in assuming responsibility for many diverse projects in the oil and chemical industries. Very desirable location. A moderate amount of traveling is involved. Salary commensurate with ability.

BOX H-811,

The Oil and Gas Journal,

Tulsa, Oklahoma

HELP WANTED

GEOLOGIST of outstanding ability, under 35, with at least 3 years' experience in northern Louisiana, gulf coast and west Texas areas. Exploration and development experience essential for Dallas office of established independent oil concern. P. O. Box 2775, Dallas, Texas.

PROCESS ENGINEER

Chemical Engineer with a minimum of three years refinery experience in operations or process design.

Work will include process engineering closely integrated with operations of new independent refinery which includes crude distillation, catalytic cracking, polymerization, coking and utilities.

Please send complete resume including salary requirements to:

Great Northern Oil Company
P. O. Box 3596
Saint Paul 1, Minnesota

PROCESS ENGINEERS

Openings for Chemical Engineering Graduates with minimum 3 years experience in Process Plant Design. Work involves project engineering, equipment application and selection, translation of process data into new plant design. Applicant should be well grounded in thermodynamics, unit operations, and equipment specifications. The work is interesting, salary and opportunities are attractive; location in Texas. Mail resume to

Box H-820,
The Oil and Gas Journal,
Tulsa, Oklahoma.

"Chemical Process Design Engineer"

Midwest engineering and construction firm desires engineer to process design plants relating to petroleum refining, chemicals, natural gas, and natural gasoline.

Experience 5 years or more in one or more of the above fields. Reply giving resume of experience, education, reference, and salary requirements. Address

Box H-855,
THE OIL AND GAS JOURNAL,
Tulsa, Oklahoma

HELP WANTED

SUBSTANTIAL independent operating company would like to permanently employ an exploration geologist. Must be experienced, qualified, and have the ability to head an exploration program, operating in Oklahoma and Kansas. Send detailed personal history, work experience & salary expected. Box H-847, The Oil and Gas Journal, Tulsa, Oklahoma.

LARGE NATURAL GAS company needs Process-Project Engineer with 3 to 5 years experience for design of gasoline plant, compressor station and gasoline treating facilities for a gas transmission company located in Colorado. Furnish complete background, data and salary expected. Box [illegible], The Oil and Gas Journal, Tulsa, Oklahoma.

Inc[illegible]
C[illegible]

Chief Geologist

For independent integrated oil company. Must have 10 years experience. Houston location. Send detailed history, giving salary expected.

Box H-853, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER OR GEOLOGIST

with broad general knowledge of the petroleum industry in East Texas, North Louisiana and South Arkansas to fill position with well established firm in area. State qualifications in detail.

Box H-795, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER

We have an opening for a Petroleum Engineer in the Engineering Department of a company manufacturing a new type oil well pump. Will supervise installation of pumps on West coast. Real opportunity for man with proper qualifications to join young organization planning expansion program. Short product orientation period will precede assignment.

Degree and five years minimum experience required. Salary open. Write sending reply to:

Bob Hill, Jr.

401 E. Wayne Street

Fort Wayne, Indiana

Phone—Eastbrook—5908

DIVISION GEOLOGIST

Independent oil company has opening in Tulsa office for Division Geologist to handle operations in Oklahoma and Kansas. Must be experienced in this area and be qualified to handle intensive exploration program. Excellent salary and opportunity. Give complete resume of past experience, education and personal information. Applications confidential.

BOX H-862,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

OIL INDUSTRY Employment Service Tom Robinson, owner, 405 Tuloma Bldg., Tulsa, Oklahoma. Specializing in Engineers with oil-industry experience.

RESERVE ENGINEER: Degree in Petroleum Engineering or Geology. Location—St. Louis, Missouri. State age, salary, references and general qualifications. Box H-827, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Chemists with or without experience for positions in Research and Development department, located in Tulsa. State qualifications and salary expected. Write Personnel Department, P. O. Box 381, Tulsa, Oklahoma.

Contracting seismograph company needs experienced personnel for Key positions. Office personnel will be semi-permanently located in Tulsa. Advise training, experience and desired salary.

BOX H-863,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

Petroleum Engineers

Graduate Petroleum Engineers with minimum 5 years' diversified production experience wanted by MAJOR OIL CO. with operations in Mid-Continent area from Gulf Coast to Canada. Salary commensurate with training and experience.

BOX H-856,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

SITUATIONS WANTED

CORROSION and communications engineer. Ten years experience pipeline business. Desires employment. Box H-835, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-GEOPHYSICIST. 30, married, 6 years experience Rocky Mountain, 5 in seismic and gravity, 1 subsurface logs. Desires position with active independent or major. Box H-845, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, desires position with independent in Mid-Continent area. Four years well sitting experience, West Texas, New Mexico and Rocky Mtn. area. Stratigraphic studies, acreage evaluation experience, recoverable reserve studies, subsurface mapping, electrical log interpretation. Box H-839, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL FINDING METHODS
Two geologists, major companies, desire establish exploration office Rocky Mountains; could accept specific jobs elsewhere. To employ new oil-finding methods based on our interpretation of laws of oil accumulation. New types, combinations of maps. Need sponsor. Now entertaining offers. Box H-793, The Oil and Gas Journal, Tulsa, Oklahoma.

AMBITIOUS MAN wants position requiring initiative, with advancement opportunities. Seven years varied geophysical and exploration experience, Geology B.S. Veteran, 34, married. Box H-854, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, 35, married, 13 years in refining, desires employment as process engineer. Experience includes laboratory, mechanical design, and process engineering. Box H-857, The Oil and Gas Journal, Tulsa, Oklahoma.

PROFESSIONAL ENGINEER, experienced in all phases of major refinery projects desires responsible association with refiner or contractor upon successful completion of major engineering projects. Box H-860, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 10 years experience in drilling, production, workovers and secondary recovery with major and independent companies, West Texas-New Mexico, wishes engineering reservoir assignment. Box H-859, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

PIPELINES ANNOUNCED: Projected pipelines indicate increasing action in central Williston Basin, where we specialize in royalties in major company blocks. For informative material, write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Mont.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

OFFERING CHOICE PRODUCING oil income royalties with large reserves per Dollar investments. A. S. Berry, P. O. Box 1583, Tulsa, Okla.

OIL PRODUCTION ROYALTIES

Interested in buying oil production and producing royalties in good producing areas. Minimum monthly income on producing properties $4000, on royalties $750.

CONTACT BOX 2775, DALLAS, TEXAS

LEASE AND DRILLING BLOCKS

WRITE TO Box 353, Spenard, Alaska, for information on available Government oil and gas leases in Alaska.

CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Investments.

TULSA INDEPENDENT wants lease or drilling deal, Illinois area, with good geology. Box H-832, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 640 acre lease Franklin County, Kansas. Kelly map shows 13 wells all now abandoned. Similar locations in nearby Baldwin area, drilled lately, have made good wells at approx. 850 ft. For location, etc., write P. O. Box 743, Tulsa, Okla.

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FOR SALE—At Oil Hill, Kansas, 4—Cooper Type 80 Twin Engine Compressor Units, with 8½"x20" Class A and 15½"x20" Class C Compressor Cylinders. Also 1—Type 80 Single DO with 6½" and 10½" x 20" Tandem Cylinders. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

ATTENTION: Oilmen—Mining Men—Core Drillers. Have Heavy-Duty Franks 2000 Rotary Drilling Unit, unitized on tandem wheels. This is rugged core-drill designed for fast and inexpensive drilling of core holes for oil & mining exploration, shallow oilwells or water wells. Unit has hydraulic raised, 38' strong four legged derrick, racking board, rotary table, blocks, hook, 5x8 mud pump, two HD Industrial Ford V-8 power units, all Unitized to move in one load. Also has automatic Pull-down for faster drilling near surface. This is a high class drilling unit for efficient and low-priced operation, and is ready to go. No drill pipe. Will sell for $17,750.00. Can be inspected at Wichtex Machinery Co., Wichita Falls, Texas or Write or call R. F. Hare, 2018 W. T. Waggoner Bldg., Ft. Worth—Ph. FA-4646.

FOR SALE: Office Desks, Chairs, Typewriter, Filing Cabinets etc. H. M. Williams Drilling Company, 701 Bitting Building, Wichita, Kansas.

STAR 45 Spudder complete, and Waukesha motor, less tools, rig house, and lines; $3700; excellent condition, ready to drill, see R. S. Aggas on lease 1 mile east, ½ south Tyro, Kansas.

EQUIPMENT WANTED

WANTED good 7¼x14 slush pump. Give location and price. Box H-851, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED core drill in good condition. 600 or 1,000 Mayhew preferred. Give price, location, and make, size and age of truck. Box H-848, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED good used triple Lee C. Moore derrick. Give location, condition and price. Box H-849, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED 4000 to 5000 ft. power rig in good condition. Give location, description and price. Box H-850, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: One—Cooper-Bessemer GMX-4 Compressor, with high pressure cylinders. Box H-841, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

CHEMICAL ENGINEER with 6-8 years experience in process control, process design and economics to be in charge of Engineering Department in small Midwest Refinery. Reply should include resume of experience, education, references and salary expected. Box H-861, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

Manufacturers' Representative for South West Texas, Houston Gulf Coast, and So. Louisiana to sell production specialty equipment through Supply Stores. Reply kept confidential.

DROVIL COMPANY
P. O. BOX 58183
LOS ANGELES 58, CALIF.

HELP WANTED

WANTED—Experienced Seismic Party Chiefs, Seismologists and Chief Computers. Must have college degree. Excellent opportunity for advancement. Replies will be held in confidence. Box H-844, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Graduate electrical, civil or mechanical engineer for office and field work by major oil company in Middle West. Please state age, experience and educational qualifications. Box H-837, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

FIELD SUPERINTENDENT: We have an opening for a Kansas district requiring supervision of 1000 bbl. daily production. Promising future. State age & qualifications. Strictly confidential. Write Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

IMMEDIATE OPENING for graduate engineer desiring sales work. Home office location, Tulsa, Oklahoma. Give complete resume of experience, references, and salary expected in first reply. Box H-803, The Oil and Gas Journal, Tulsa, Oklahoma.

MAINTENANCE AND CONSTRUCTION SUPERVISOR

for expanding independent refinery in Upper Midwest. 5 or more years refinery or process plant experience required. Challenging opportunity for qualified man. Write giving full particulars.

Box H-831, The Oil and Gas Journal, Tulsa, Oklahoma.

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Unusual opening with moderate size, well-established engineering firm for young chemical engineer preferably with major company or equivalent experience. Good educational background and four or more years experience with modern refinery processing and design and economic studies. Acquaintance with catalytic reforming and cracking desirable.

An ambitious and resourceful engineer will find this an outstanding opportunity for personal advancement in assuming responsibility for many diverse projects in the oil and chemical industries. Very desirable location. A moderate amount of traveling is involved. Salary commensurate with ability.

BOX H-811,

The Oil and Gas Journal,

Tulsa, Oklahoma

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GEOLOGIST of outstanding ability, under 35, with at least 3 years' experience in northern Louisiana, gulf coast and west Texas areas. Exploration and development experience essential for Dallas office of established independent oil concern. P. O. Box 2775, Dallas, Texas.

PROCESS ENGINEER

Chemical Engineer with a minimum of three years refinery experience in operations or process design.

Work will include process engineering closely integrated with operations of new independent refinery which includes crude distillation, catalytic cracking, polymerization, coking and utilities.

Please send complete resume including salary requirements to:

Great Northern Oil Company
P. O. Box 3596
Saint Paul 1, Minnesota

PROCESS ENGINEERS

Openings for Chemical Engineering Graduates with minimum 3 years experience in Process Plant Design. Work involves project engineering, equipment application and selection, translation of process data into new plant design. Applicant should be well grounded in thermodynamics, unit operations, and equipment specifications. The work is interesting, salary and opportunities are attractive; location in Texas. Mail resume to

Box H-820,
The Oil and Gas Journal,
Tulsa, Oklahoma.

"Chemical Process Design Engineer"

Midwest engineering and construction firm desires engineer to process design plants relating to petroleum refining, chemicals, natural gas, and natural gasoline.

Experience 5 years or more in one or more of the above fields. Reply giving resume of experience, education, reference, and salary requirements. Address

Box H-855,
THE OIL AND GAS JOURNAL,
Tulsa, Oklahoma

HELP WANTED

SUBSTANTIAL independent operating company would like to permanently employ an exploration geologist. Must be experienced, qualified, and have the ability to head an exploration program, operating in Oklahoma and Kansas. Send detailed personal history, work experience & salary expected. Box H-847, The Oil and Gas Journal, Tulsa, Oklahoma.

LARGE NATURAL GAS company needs Process-Project Engineer with 3 to 5 years experience for design of gasoline plant, compressor station and gasoline treating facilities for a gas transmission company located in Colorado. Furnish complete background, data and salary expected. Box H-852, The Oil and Gas Journal, Tulsa, Oklahoma.

Chief Geologist

For independent integrated oil company. Must have 10 years experience. Houston location. Send detailed history, giving salary expected.

Box H-853, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER OR GEOLOGIST

with broad general knowledge of the petroleum industry in East Texas, North Louisiana and South Arkansas to fill position with well established firm in area. State qualifications in detail.

Box H-795, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER

We have an opening for a Petroleum Engineer in the Engineering Department of a company manufacturing a new type oil well pump. Will supervise installation of pumps on West coast. Real opportunity for man with proper qualifications to join young organization planning expansion program. Short product orientation period will precede assignment.

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Fort Wayne, Indiana

Phone—Eastbrook—5908

DIVISION GEOLOGIST

Independent oil company has opening in Tulsa office for Division Geologist to handle operations in Oklahoma and Kansas. Must be experienced in this area and be qualified to handle intensive exploration program. Excellent salary and opportunity. Give complete resume of past experience, education and personal information. Applications confidential.

BOX H-862,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

OIL INDUSTRY Employment Service. Tom Robinson, owner, 405 Tuloma Bldg., Tulsa, Oklahoma. Specializing in Engineers with oil-industry experience.

RESERVE ENGINEER: Degree in Petroleum Engineering or Geology. Location—St. Louis, Missouri. State age, salary, references and general qualifications. Box H-827, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Chemists with or without experience for positions in Research and Development department, located in Tulsa. State qualifications and salary expected. Write Personnel Department, P. O. Box 381, Tulsa, Oklahoma.

Contracting seismograph company needs experienced personnel for Key positions. Office personnel will be semi-permanently located in Tulsa. Advise training, experience and desired salary.

BOX H-863,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

Petroleum Engineers

Graduate Petroleum Engineers with minimum 5 years' diversified production experience wanted by MAJOR OIL CO. with operations in Mid-Continent area from Gulf Coast to Canada. Salary commensurate with training and experience.

BOX H-856,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

SITUATIONS WANTED

CORROSION and communications engineer. Ten years experience pipeline business. Desires employment. Box H-835, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-GEOPHYSICIST, 30, married, 6 years experience Rocky Mountain, (5 in seismic and gravity, 1 subsurface logs.) Desires position with active independent or major. Box H-845, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, desires position with independent in Mid-Continent area. Four years well sitting experience, West Texas, New Mexico and Rocky Mtn. area. Stratigraphic studies, acreage evaluation experience, recoverable reserve studies, subsurface mapping, electrical log interpretation. Box H-839, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL FINDING METHODS
Two geologists, major companies, desire establish exploration office Rocky Mountains; could accept specific jobs elsewhere. To employ new oil-finding methods based on our interpretation of laws of oil accumulation. New types, combinations of maps. Need sponsor. Now entertaining offers. Box H-793, The Oil and Gas Journal, Tulsa, Oklahoma.

AMBITIOUS MAN wants position requiring initiative, with advancement opportunities. Seven years varied geophysical and exploration experience, Geology B.S. Veteran, 34, married. Box H-854, The Oil and Gas Journal, Tulsa, Oklahoma.

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WANT TO BUY settled oil production by independent operator direct from the producer. No deals too small or too large. P. O. Box 77, Lafayette, La. Dudley J. LeBlanc.

OIL PROPERTIES WANTED: Settled or semi-settled production of 100 to 1000 bbls. daily in Oklahoma or Kansas. Properties must stand thorough inspection. Contact Morris Sitrin, P. O. Box 1160, Tulsa, Okla., with particulars.

OIL PRODUCTION WANTED

Oil company wishes to purchase settled oil production direct from producers. Submit offerings together with complete detailed information and if possible an engineer's report. Guardian Oil, 821 Time & Life Building, Rockefeller Center, New York City.

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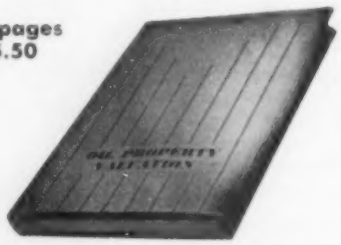

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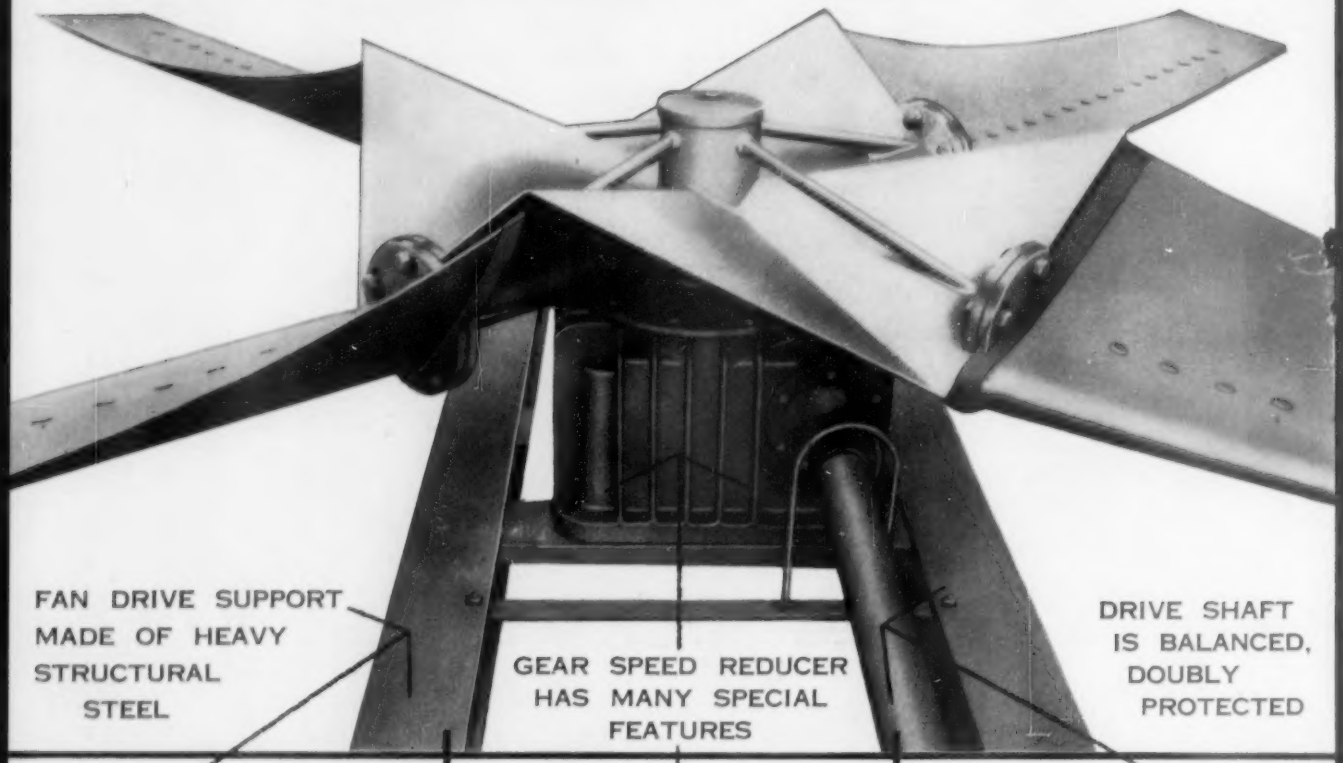
PRITCHARD DRIVE ASSEMBLY IS BIGGER, BETTER, MORE STRONGLY SUPPORTED!


FAN DRIVE SUPPORT MADE OF HEAVY STRUCTURAL STEEL
GEAR SPEED REDUCER HAS MANY SPECIAL FEATURES
DRIVE SHAFT IS BALANCED, DOUBLY PROTECTED

The fan drive support on all Pritchard cooling towers is one-piece, welded construction; made of heavy structural steel. After the gear speed reducer and driver are aligned, the driver and reducer are doweled for permanent alignment. This insures permanency of drive alignment regardless of settlement in the tower structure. The support transmits operating and dead load uniformly to the tower framework.

Pritchard gear speed reducers have many special features: superior shaft seals, heavier bearings, more conservative horsepower ratings, more rigid housings, more positive lubrication than any other gear speed reducer available. They are manufactured by old-line speed reducer makers especially for the rigorous service demanded on cooling towers and carry an AGMA label certifying their ratings.

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If you buy under the code of strict compliance to every specification, you will find Wyatt Metal & Boiler Works fully willing and able to fulfill every requirement.

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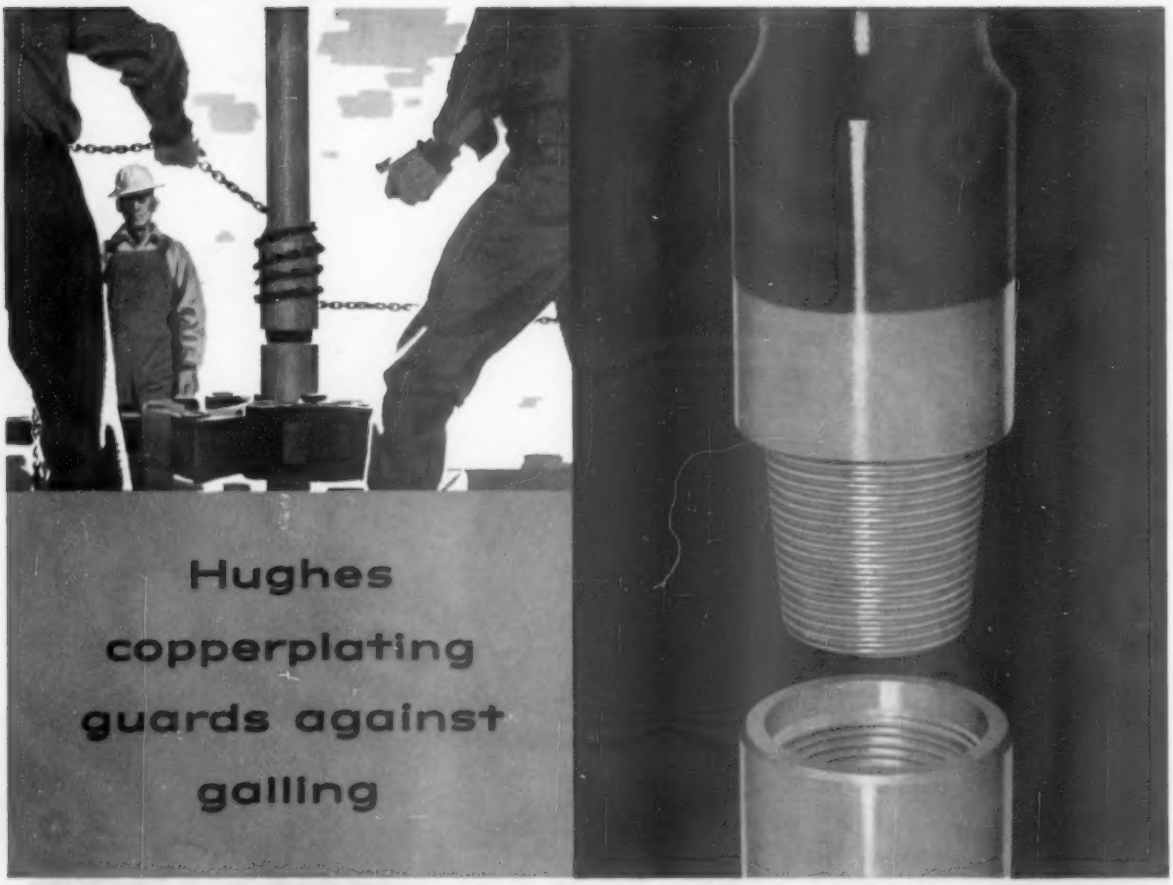
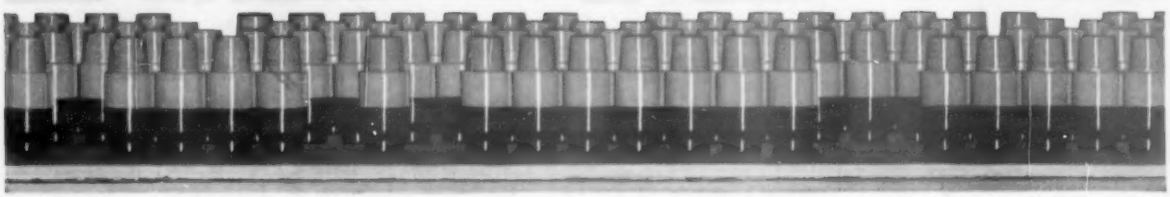
SINCE 1913





The *breaking-in* period is the critical time for box and pin connections. That is why all Hughes tool joint box and pin connections are copperplated to guard against galling. In addition, Hughes tool joints are machined after heat-treating to assure a more uniform thread engagement. Of all the surface treatments tested for threads and shoulders during the 36 years we have specialized in developing and manufacturing tool joints, copperplating has proved to be the most effective anti-galling agent.

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